T. R. Elliott

DESCRIPTIVE CATALOGUE

OF THE

SPECIMENS ILLUSTRATING

SURGICAL PATHOLOGY

IN THE

MUSEUM OF UNIVERSITY COLLEGE, LONDON.

NEW EDITION.

BY

RAYMOND JOHNSON, B.S., F.R.C.S.,
SURGEON TO UNIVERSITY COLLEGE HOSPITAL,

AND

T. W. P. LAWRENCE, M.B., F.R.C.S.,
CURATOR OF THE MUSEUM.

PART III.

INJURIES AND DISEASES OF THE URINARY AND MALE GENERATIVE ORGANS, BREAST, SKIN AND SUBCUTANEOUS TISSUE, NOSE, EAR, AND EYE. MALFORMATIONS AND DEFORMITIES.

M19446

OPIES MAY BE OBTAINED AT THE OFFICE OF THE COLLEGE.

1906.

22501625033

WELLCOME
LIBRARY

Wellcome Library
for the History
and Understanding
of Medicine

DESCRIPTIVE CATALOGUE

OF THE

SPECIMENS ILLUSTRATING

SURGICAL PATHOLOGY

IN THE

MUSEUM OF UNIVERSITY COLLEGE, LONDON.

NEW EDITION.

BY

RAYMOND JOHNSON, B.S., F.R.C.S.,
SURGEON TO UNIVERSITY COLLEGE HOSPITAL,

AND

T. W. P. LAWRENCE, M.B., F.R.C.S.,
CURATOR OF THE MUSEUM.

PART III.

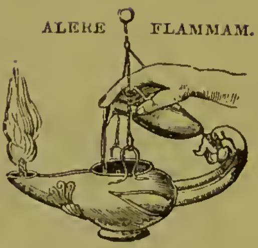
INJURIES AND DISEASES OF THE URINARY AND MALE GENERATIVE ORGANS, BREAST, SKIN AND SUBCUTANEOUS TISSUE, NOSE, EAR, AND EYE. MALFORMATIONS AND DEFORMITIES.

COPIES MAY BE OBTAINED AT THE OFFICE OF THE COLLEGE.

1906.

M19446

WELLCOME
LIBRARY
WO142
1882
1841


ALERE FLAMMAM.

PRINTED BY TAYLOR AND FRANCIS,
RED LION COURT, FLEET STREET.

TABLE OF CONTENTS.

PART III.

	Numbers	Page
INJURIES AND DISEASES OF THE KIDNEY	1871 to 1928	1
Injuries	1871	1
Consecutive Nephritis	1872 to 1877	1
Nephrolithiasis	1878 to 1914	4
Calculi from the Kidney	1878 to 1884 A	4
Changes due to the Presence of Calculi in the Kidney and Ureter	1885 to 1914	6
Tuberculous Disease	1914 A to 1917	13
Tumours	1918 to 1927	15
Hydronephrosis and Pyonephrosis	1928	20
INJURIES AND DISEASES OF THE URINARY BLADDER	1929 to 2063	20
Injuries	1929 to 1932	20
Foreign Bodies	1933 to 1944	22
Hypertrophy and Dilatation	1945 to 1948	24
Sacculi	1949 to 1955	26
Cystitis	1956 to 1962	28
Tuberculous Disease	1963	30
Simple Tumours	1964 to 1980	31
Malignant Tumours	1981 to 1986	35
Calculus	1987 to 2063	38
Bladders containing Calculi	1987 to 1996	38
Calculi from the Bladder	1997 to 2051	40
General Characters	1997 to 2016	41
Uric Acid	2017 to 2022	44
Urate of Ammonium	2023 to 2025	45
Xanthine	2026	46
Oxalate of Calcium	2027 to 2031	46
Phosphatic	2032 to 2039	47
Cystin	2040 to 2043	49
Carbonate of Calcium	2044	50
Mixed	2045 to 2051	50
Bladders upon which Lateral Lithotomy has been performed	2052 to 2054	52
Lithotrity	2055 to 2063	52

	Numbers	Page
Injuries and Diseases of the Urethra	2064 to 2087	54
Rupture		54
Foreign Bodies	2064, 2065	54
Calculi	2066 to 2074	55
Stricture	2075 to 2087	56
Complications of Stricture	2079 to 2087	59
Injuries and Diseases of the Testicle and Spermatic Cord	2088 to 2167	63
Injuries of the Testicle	2088	63
Inflammation of the Tunica vaginalis	2089	63
Hydrocele	2090 to 2109	63
Hæmatocele	2110 to 2114	67
Acute Orchitis	2115, 2116	69
Tuberculous Disease of the Testicle	2117 to 2132	70
Syphilitic Disease of the Testicle	2133 to 2144	75
Sarcoma of the Testicle	2145 to 2154	79
Carcinoma of the Testicle	2155 to 2159	82
Mixed Tumours of the Testicle	2160 to 2164	83
Varicocele	2165	86
Solid Tumours of the Spermatic Cord	2166, 2167	86
Diseases of the Scrotum	2168 to 2172	87
Elephantiasis		87
Dermoid Cyst	2168	87
Carcinoma	2169 to 2172	87
Diseases of the Vesiculæ Seminales	2173, 2174	88
Diseases of the Prostate	2175 to 2200	89
Abscess	2175	89
Chronic Enlargement	2176 to 2187	89
Calculi	2188 to 2192	93
Tuberculous Disease	2193, 2194	95
Tumours	2195 to 2199	96
Cysts	2200	98
Diseases of the Penis	2201 to 2213	98
Phimosis	2201, 2202	98
Hypertrophy of Skin	2203	99
Tumours	2204 to 2213	99
Diseases of the Breast	2214 to	102
Atrophy		102
Hypertrophy		102
Acute Inflammation		102
Chronic Interstitial Mastitis	2214 to 2216	102
Chronic Abscess	2217	103
Tuberculous Disease	2218, 2219	104
Syphilitic Disease	2220	105
Actinomycosis	2221	105
Cysts	2222 to 2243	106
Adenoma	2244 to 2267	113
Sarcoma	2268 to 2277	121
Carcinoma	2278 to 2324	124
Spheroidal-cell	2278 to 2314	124
Columnar-cell	2315 to 2317	137
Of the Male Breast	2321 to 2324	140
Injuries and Diseases of the Skin, Subcutaneous Tissues, and Fasciæ	2325 to 2449	141
Injuries of the Skin	2325 to 2329	141
Inflammation	2330 to 2336	141
Infective Granulomata of the Skin	2337 to 2363	143
Tubercle	2337	144
Syphilis	2338	144
Leprosy	2339 to 2357	145
Actinomycosis		148
Madura Foot	2358 to 2363	148
Fibroma	2364 to 2380	150
Lipoma of the Subcutaneous Tissues	2381 to 2389	154

	Numbers	Page
Injuries and Diseases of the Skin, &c. (*continued*).		
Myxoma of the Subcutaneous Tissues	2389	156
Teratoma of the Skin	2390	156
Angioma	2391 to 2397	156
Lymphangioma	2398 to 2401	159
Papilloma of the Skin	2402 to 2410	160
Sarcoma	2411 to 2434	162
Fibro-sarcoma and Spindle-cell	2411 to 2416	162
Small Round-cell	2417 to 2420	164
Alveolar	2421 to 2426	165
Melanotic	2427 to 2432	167
Sarcomata of the Deep Fasciæ	2433, 2434	170
Carcinoma of the Skin	2435 to 2449	171
Squamous-cell	2435 to 2445	171
Rodent	2446 to 2449	175
Diseases of the Sebaceous Glands	2450 to 2458	177
Sebaceous Cysts	2450 to 2458	177
Diseases of the Sweat-Glands	2459	179
Hypertrophy	2459	179
Diseases of the Nails	2460, 2461	180
Gangrene of the Extremities	2462 to 2469	180
Amputation Stumps	2470 to 2486	183
Congenital Malformations	2487 to 2582	186
Of the Face and Mouth	2487 to 2493	186
Cephalocele	2494 to 2498	188
Dermoid Cysts of the Scalp	2499	190
Congenital Cysts and Fistulæ of the Neck	2500 to 2505	191
Teratoma of the Neck	2506, 2507	192
Cervical Ribs	2508	193
Spina bifida	2509 to 2527	193
Dermoid Cysts of the Trunk	2528	200
Congenital Sacro-coccygeal Tumour	2529 to 2533	200
Of the Rectum and Anus and Lower Genito-urinary Tract.	2534 to 2553	201
Malposition of the Testicle	2554 to 2557	207
Of the Upper Limb	2558 to 2565	209
Of the Lower Limb	2566 to 2582	211
Congenital Dislocation of the Hip	2566	211
Malformations of the Bones	2567, 2568	212
Genu Recurvatum	2569	213
Constrictions by Amniotic Bands	2570	213
Congenital Club-foot	2571 to 2577	213
Malformations of the Toes	2578 to 2582	215
Acquired Deformities	2583 to 2602	216
Lateral Curvature of the Spine	2583 to 2587	216
Spondylolisthesis	2588	217
Of the Lower Limb	2589 to 2602	218
Coxa Vara		218
Genu Valgum	2589, 2590	219
Contraction of the Knee	2591	219
Acquired Club-foot	2592 to 2597	220
Pes Cavus	2598, 2599	222
Flat-foot	2600	222
Hallux Valgus	2601, 2602	223
Injuries and Diseases of the Nose	2603 to 2621	223
Gangrene of the Skin of the Nose	2603	223
Hypertrophy of the Skin of the Nose	2604 to 2606	223
Foreign Bodies in the Nasal Cavities	2607, 2608	224
Chronic Inflammation of the Mucous Membrane	2609 to 2616	224
Tuberculous Disease of the Nasal Fossæ	2616 A	226
Syphilitic Disease of the Nasal Fossæ		226
Tumours of the Nasal Cavities	2616 B	227
Fibroma and Sarcoma of the Naso-Pharynx	2617 to 2619	227
Diseases of the Accessory Sinuses	2620, 2621	228

	Numbers	Page
NJURIES AND DISEASES OF THE EAR	2622 to 2635	229
Foreign Bodies		229
Exostosis of the External Auditory Meatus	2622	229
Chronic Suppuration of the Middle Ear and its Complications	2623 to 2635	229
Tuberculous Disease of the Middle Ear		234
Carcinoma of the Ear		234
INJURIES AND DISEASES OF THE EYE	2636 to 2736	235
Non-penetrating Injuries	2636 to 2638	235
Penetrating Injuries	2639 to 2660	235
Burns and Scalds	2661	239
Complications following Operations	2662 to 2668	239
Diseases of the Coats of the Eyeball	2669 to 2735	241
Corneal Ulcers and their Complications	2669 to 2677	241
Staphyloma	2678 to 2689	242
Inflammation of the Iris and Ciliary Body	2690 to 2702	244
Diseases of the Choroid and Retina	2703 to 2708	246
Glaucoma	2709 to 2735	247
Tumours of the Eyeball	2720 to 2735	249
Persistent Hyaloid Artery	2736	252
INJURIES AND DISEASES OF THE ORBIT	2737 to 2740	252
Wounds	2737	252
Fractures		252
Tumours	2738 to 2740	252
INDEX	....	255

END OF PART III.

SURGICAL PATHOLOGY.

PART III.

INJURIES AND SURGICAL DISEASES OF THE KIDNEY.

Injuries.

As the result of injuries not complicated by an external wound, a kidney may be damaged in any degree between a slight contusion and an extensive rupture (1871), or the pelvis or ureter may be torn. Hæmaturia is a common result of such injuries, and blood or urine may be extravasated into the tissues around the kidney or into the peritoneal cavity. Rupture of the ureter is occasionally followed by hydronephrosis.

The kidney may be involved in a penetrating wound, and occasionally in extensive injuries of the parietes the organ may be prolapsed.

1871. The right kidney of a child, extensively lacerated by injury. The lower part of the kidney is entirely separated from the rest and other smaller portions have been torn away from the anterior surface. 6866

From a girl, aged 9, who died 4 hours after being run over by an omnibus, the wheel of which passed obliquely across the abdomen. There was dulness in the right loin. The ruptured liver (No. 1561) and the ruptured right lung (No. 1869) are also preserved in the Museum.

Consecutive Nephritis.

Consecutive nephritis includes the various forms of inflammation of the kidney which may result from diseases of the lower parts of the urinary tract. It is the immediate cause of death in the majority of fatal cases of diseases of the bladder, prostate and urethra. The two most important forms of consecutive inflammation of the kidneys are (1) Simple chronic interstitial nephritis, resulting from the increased pressure due to obstruction to the flow of urine; and (2) Acute infective nephritis resulting from the extension of infective processes from the lower urinary tract to the kidneys. Very commonly these two forms of consecutive inflammation occur in association.

1. *Simple Chronic Interstitial Nephritis.*—The increased pressure which is the cause of the chronic inflammation of the kidney is most commonly the result of obstruction at the vesical orifice of the ureter, and is caused by the force of secretion of the kidney. The most important causes which lead to obstruction at one or both ureteral orifices are, chronic cystitis with thickening of the mucous membrane and submucous tissue, hypertrophy of the muscular wall of the bladder (1947), dilatation of the bladder with residual urine (1948), and the pressure of tumours or sacculi. No. 1877 shows the effect upon the kidney of the obstruction of the ureter by a calculus.

The changes produced by increased tension are as follows:—The ureters are dilated, and at the same time often increased in length, so as to become tortuous. Sometimes they may reach such a size as almost to resemble a piece of small intestine. Their walls are thickened, chiefly by fibroid tissue; but there is also some hypertrophy of the muscular coat. The mucous membrane is white in colour and more opaque than natural. The pelvis of the kidney is similarly dilated. The kidney is at first somewhat enlarged (1968). Its cortex is thicker than natural and tough, pale in colour and opaque. The capsule separates with some difficulty, tearing the renal substance and leaving its surface coarse. At first the pyramids only show the same change as the cortex. Later by a process of simple absorption, without any ulceration, the papillæ become flattened, then concave, and finally the whole pyramid may be absorbed, leaving a deep hollow still lined with opaque, white, smooth, mucous membrane continuous with that of the calices (1877, 1968). As the disease advances, the thickened cortex begins to contract, at the same time becoming excessively tough. It is still pale and opaque in colour. By these processes the kidney may at last be reduced to a large irregular bag, one side of which is smooth and formed by the dilated pelvis, and the other pouched, the pouches corresponding to the dilated calices and the absorbed pyramids, and the wall being formed by the remains of the cortex (1877). In advanced cases the capsule is abnormally adherent to the surrounding fat, which also may be indurated. Finally the kidney may be so damaged that the force of its secretion is no longer able to prevent the tendency to contraction of the fibroid cortex, and the whole gland shrinks.

The microscope shows that the whole process is a chronic interstitial inflammation with development of fibroid tissue between the tubules and subsequent contraction, the renal epithelium undergoing atrophy.

2. *Acute Infective Nephritis.*—This condition is the result of an infection of the kidney by pyogenic organisms, of which one of the most important is the Bacillus coli communis, reaching it from the bladder. The infection usually occurs by way of the interior of the ureter, and spreads from the renal pelvis to the renal substance (*pyelo-nephritis*). The mucous membrane of the ureter and renal pelvis presents, in severe cases, appearances similar to those seen in the bladder in acute cystitis; it is swollen and dark red in colour, often with patches of hæmorrhage (1872) and sometimes coated with an adherent membranous exudation (1875). The kidney is swollen and congested; the pyramids are marked by pale yellow streaks extending outwards towards the cortex; in the most severe cases the pyramids may be necrotic (1872, 1873).

The cortex is swollen, usually mottled red and yellowish red, with yellow streaks running through it to the surface, at which point there is often a minute collection of pus (1874, 1876). If the capsule be stripped off, the small abscesses are seen to be collected in groups, corresponding to the parts of the cortex belonging to different pyramids. The general surface of the kidney is mottled red and yellowish red, and dotted over with small yellow points of pus, around which there are usually areas of intense redness (1876). The substance of the kidney is soft. The capsule is adherent to the surrounding fat, which is often redder than natural.

This condition was named *pyelo-nephritis* by Rayer, and that term is still usually employed. It is sometimes called the suppurating or "surgical kidney."

The microscope shows acute interstitial inflammation of the kidney, terminating in points of suppuration. The epithelium of the straight tubules is frequently wanting; in the convoluted tubes it is swollen and granular. The intertubular spaces are crowded with small round cells which, in the situation of the abscesses, have accumulated to such an extent as to destroy the renal tissue. The organisms causing the infection can be demonstrated in the renal tubules.

It is, of course, common to meet with pyelo-nephritis in the kidney which has previously been dilated and chronically inflamed as a consequence of obstruction to the downward passage of the urine. The appearances will then be a combination of the two conditions (1872).

If a patient recover from acute interstitial nephritis, the kidney is left more or less shrunken, irregular in form, and marked by deep puckered cicatrices. The tissue is indurated and tough, and the capsule adherent to the cortex and often also to the surrounding fat.

1872. Half a kidney, the seat of suppurative pyelo-nephritis. The size of the kidney is normal. The pelvis is dilated; its mucous membrane is swollen, rough, injected, and in parts the seat of hæmorrhagic patches. The calices are slightly dilated and their inner surfaces are similar in appearance to that of the pelvis. The papillæ are normal in shape but yellow in colour and necrotic. The pyramids present yellow streaks, extending outwards from the papillæ and surrounded by a zone of congestion. The cortex is of normal thickness and in parts mottled by congestion. The capsule is normal. 7699

From a man, aged 64, who was admitted into U.C.H. in 1896, with a month's history of shivering and sickness, with pain in the abdomen and back and along the urethra; the stream was small, the urine had become thick after the use of catheters. On admission offensive urine, containing muco-pus, was drawn off. The bladder was washed out regularly. The patient rapidly became weaker and died on the 5th day, the temperature throughout varying between 96° and 97°. There was a stricture at the junction of the bulbous and membranous portions of the urethra; the prostate was enlarged and superficially ulcerated around the urethral orifice; the bladder was hypertrophied and the mucous membrane inflamed; both ureters were dilated and inflamed. Both kidneys were the seat of pyelo-nephritis. (Surg. Reg. Rep. 1896, p. 118, No. 2590.)

1873. A kidney, the seat of suppurative nephritis, in section. The kidney is enlarged. The capsule has been removed, leaving a smooth surface which is mottled with pale yellow and darkly congested areas and marked in all parts by dilated venules. On the divided surface the cortex is seen to be slightly swollen and mottled in a manner similar to that above described. Many of the pyramids present necrotic patches, which are greyish in the centre, yellow superficially and surrounded by a zone of congestion. The papillæ are somewhat swollen. One of the upper calices is slightly dilated and its mucous membrane injected and marked by small hæmorrhages. The pelvis is not dilated. 7795

From a man, aged 62, who was admitted into U.C.H. in April 1897, with retention of urine. Eighteen years previously he had had gonorrhœa, and seven years later was treated for stricture. On admission the retention was relieved with a No. 9 Fr. catheter; the urine was clear, sp. gr. 1015, and contained a trace of albumen; the prostate was enlarged and tender, and on pressing on it with a finger in the rectum pus oozed from a catheter in the urethra. The stricture was dilated to No. 13 Fr. The temperature varied from 97° to 103°·4, without rigors; the pulse became rapid and feeble, the tongue glazed, and there was headache, but no vomiting. A week after admission parotitis developed on the left side, and four days later on the right side. For two days before death the patient was semi-comatose. The stricture was in the membranous part of the urethra; there was an abscess in the right half of the prostate; the bladder was hypertrophied and the seat of chronic cystitis. The opposite kidney was in a condition similar to that shown in the specimen. (Surg. Reg. Rep. 1897, p. 128, No. 622.)

1874. A left kidney, the seat of suppurative nephritis, together with the bladder, which is the seat of cystitis. The kidney is of normal size. The pelvis and ureter are moderately dilated and the mucous membrane is thickened. The calices are dilated; some of the renal papillæ are flattened, at the lower part of the kidney one or two are necrotic, and the surface of one of the upper ones is covered with a yellowish deposit. The whole of the renal substance is marked by yellow streaks and dots surrounded by zones of congestion. In the lower end of the kidney a ragged cavity in the renal substance has resulted from the dilatation of an inflamed calix. The surface of the kidney exposed by the removal of the capsule is smooth, and marked everywhere by slightly raised, small, yellow areas which in many places have coalesced into large yellow patches.

The bladder is small. The muscular coat is thin and the mucous membrane and submucous tissue are thickened. The surface of the mucous membrane is irregular and presents numerous small patches of exudation and ulceration. The ureters are dilated and thickened. 9163

From a case of paraplegia following fracture of the spine.

1875. A left kidney with the upper part of the ureter, in vertical section, showing intense pyelitis. The kidney is slightly enlarged, and the pelvis, calices and ureter slightly dilated. The capsule, which was not thickened, has been readily separated. The mucous membrane of the pelvis and calices is opaque, thickened and its surface roughened so as in parts to be almost warty. The renal papillæ are flattened, and the surface of the extremities of the calices is covered with a soft, easily detached, fibrinous deposit. The mucous membrane of the ureter presents changes similar to, but less marked than, those in the pelvis. 8616

From a man, aged 63, who was admitted into U.C.H. with incomplete retention of urine in Oct. 1900. A catheter was passed for the first time on Oct. 17, and on Oct. 27 cystitis developed. On Nov. 1 the patient had a rigor, and on Nov. 5 complained of pain in the left lumbar region. On Nov. 17 suppurative parotitis developed. For seven days before the patient's death, on Dec. 7, the quantity of urine passed was about one-third the normal amount. At the *post mortem* examination a slight stricture was found in the bulbous portion of the urethra; the prostate was not enlarged; the bladder was hypertrophied and fasciculated and the mucous membrane slate-grey in colour. The right kidney was shrunken and fibroid and the pelvis dilated. (Surg. Reg. Rep. 1900, p. 192, No. 2033.)

1876. Half a right kidney, the seat of acute pyelo-nephritis. The pelvis and calices are dilated, the mucous membrane being thickened and its surface yellowish brown and irregular. The inflammation of the renal substance is most marked in the upper half, where it presents varying appearances, some parts being marked by yellow streaks extending to the surface, others being irregularly mottled by dark areas of congestion and yellow areas of suppuration. The surface of the kidney, from which the capsule has been removed, is smooth, and presents numerous groups of small abscesses many of which are surrounded by a narrow zone of congestion. 9265

Microscopic Structure.—In addition to the acute inflammatory changes, scattered giant-cells are present, suggestive of tuberculous deposits.

From a man, aged 57, who was admitted into St. Pancras Infirmary on April 24, 1903, with retention of urine resulting from stricture of the urethra. The urine was alkaline and contained large quantities of pus. Death occurred on April 26. There was tubercle of the lungs and left epididymis; in the mucous membrane of the bladder were several shallow ulcers.

1877. Half a right kidney showing dilatation of the pelvis and calices as the result of obstruction of the ureter. The external measurements of the kidney are not increased; the pelvis is greatly dilated, and as the result of the dilatation of the calices and the complete absorption of the pyramids a number of smooth-walled cavities extend from the pelvis into the kidney substance. The cortical substance is reduced to a thickness of 5 mm. The capsule is thickened and unduly adherent. 6863

From a case in which the lower extremity of the right ureter was obstructed by a calculus. (See No. 1898.)

NEPHROLITHIASIS.

Calculi from the Kidney.

The calculi preserved in this Series have either been removed from the kidney by operation during life or discovered after death.

Calculi deposited in the kidney from unaltered urine are called "primary," and are almost invariably composed of uric acid or oxalate of calcium, of which the former is the more common. "Secondary" calculi result from alterations in the urine caused by microbic infection and usually attended with alkaline decomposition. Such deposits are most usually composed of a mixture of the ammonio-magnesium phosphate (triple phosphate) with phosphate of calcium; they are frequently deposited on the surface of a primary calculus of uric acid or oxalate of calcium.

A small calculus occupying the pelvis or one calix may be oval, rounded, or heart-shaped (1884 A, 1900); the larger stones usually assume, however, a very characteristic shape, consisting of a central portion occupying the pelvis and irregular branches, often with expanded ends, corresponding to the various calices (1882). Renal calculi are sometimes multiple and facetted. The other features of renal calculi, which vary with their composition, are described in connection with the urinary calculi removed from the bladder, among which are examples of the rarer constituents of calculi, such as cystine and xanthine.

1878. Twelve oxalate of calcium calculi from a kidney which was the seat of a carcinomatous growth. The calculi have a polished surface like porcelain, and are bluish grey in colour. Most of the smaller stones are facetted, and four of them present one or two small sharp spinous projections. Two of the stones are much larger than the rest and present several similar spines. Two of the stones which have been divided present a very delicate and regular lamination; the divided surface of each has taken a high polish. 7751

The kidney is preserved in the Medical Series.

1879. Parts of five calculi taken after death from the pelvis of the kidney. The largest calculus measures 5 cm. in length and is of an irregular branched form, corresponding with that of the dilated pelvis and calices.

The smaller calculi are from separate calices; those which have been cut through are composed of a pale nucleus of uric acid, around which is a very narrow blood-stained zone; the superficial part is of mixed phosphates. 2625

1880. Two calculi, one from each kidney, taken after death from the body of a man who died of phthisis.

Each measures about 4·5 cm. in the chief diameter, and is covered on the surface with a layer of crystalline oxalate of calcium. The crystals are not set at right angles to the surface of the stone.

The centre of each calculus is also composed of oxalate of calcium, for the most part deeply blood-stained. 5568

1881. A kidney laid open from the outer border and dried, to show a calculus which was moulded to the pelvis. The lower end of the calculus is pointed and lay in the ureter. In the substance of the kidney are numerous small rounded calculi, varying in size from a mustard-seed to a pea; they are smooth, pale fawn-coloured, and composed of uric acid. 5075

1882. A large renal calculus, removed after death. It measures 10 cm. in length and consists of a central portion prolonged into two more slender branches, each of which terminates in a number of irregular processes corresponding with the dilated calices which they occupied. The lower division of the calculus is much the larger and its terminal projections present a coarsely granular surface. The upper half of the calculus is nearly white and the lower part fawn-coloured. The stone is composed chiefly of uric acid.

1883. A small irregular calculus and a separate fragment, removed by operation from the kidney.

From a woman, aged 27, who had an attack of hæmaturia at the age of 14. At the age of 20, after a severe illness thought to be typhoid fever, hæmaturia again occurred and was followed by the development of a tumour in the right side of the abdomen; this gradually increased and was attended with constant pain, seldom severe. Occasional attacks of severe pain occurred, with vomiting, diarrhœa and great thirst. In August 1884, when the patient was admitted into U. C. H., she was extremely emaciated and there was a large tumour of the right kidney, from which turbid urine was withdrawn by aspiration. On September 6, Mr. Beck exposed the enlarged right kidney by a lumbar incision; the distended kidney was incised and the stone preserved in the specimen extracted. A large quantity of blood-stained urine was passed after the operation. The wound had nearly healed when the patient was discharged on the 37th day (Surg. Reg. Rep. 1884, p. 42, No. 1797). Shortly afterwards the wound opened and discharged urine freely for some time, but then closed. Eight months later the patient was readmitted to the hospital with symptoms of calculous pyelitis in the left kidney; the latter was exposed by a lumbar incision and a number of small stones removed from it. Death occurred 2 weeks after the operation, in a uræmic convulsion. Both the kidneys were dilated and the renal substance small in amount; the upper end of the left ureter was blocked by a small calculus. (Surg. Reg. Rep. 1885, p. 63, No. 1237.)

1884. A calculus shaped like a bean, which was removed by operation from the kidney. It measures 2·5 cm. in length; it is very hard and its surface studded with small tubercles. It is probably composed of oxalate of calcium.

From a married woman, aged 26, who was admitted into U. C. H., under the care of Dr. Wilson Fox, on March 6, 1883. She had been confined on Jan. 20, and early in February began to experience pain in the right side of the abdomen extending across the back and down the right thigh. On admission there was a tumour in the right renal region; there was irregular fever, the maximum being 104°·6; the urine was acid and contained pus. On March 21 Mr. Berkeley Hill performed lumbar nephrotomy, opening a large pyonephrosis in which was the calculus preserved in the specimen. The patient recovered. (Mr. Hill's *Case-books*, 1883, p. 187.)

1884 A. A flattened oval calculus, removed by nephrolithotomy. It measures 2·3 cm. by 1·7 cm. by 1 cm. The surface of the calculus is of a pale reddish brown colour and covered throughout with small glistening crystals. It is composed of oxalate of calcium. 9392

From a woman, aged 25, under the care of Mr. Godlee, in Oct. 1903. The stone lay loose in the renal pelvis and had caused hæmaturia, but very little pain. The presence of the calculus was confirmed by radiography.

Changes due to the presence of Calculi in the Kidney and Ureter.

A calculus lodged in a single calix may cause but little general disease of the kidney (1885); when situated in the pelvis or ureter it usually gives rise to serious changes. By partially obstructing the ureter, it may lead to dilatation of the pelvis and calices and absorption of the pyramids, and finally to the formation of a sacculated kidney (1886), such as has already been described as the effect of partial obstruction of the ureter from other causes. This condition when present in an advanced degree is known as calculous hydronephrosis (1897). In many cases of calculous disease of long standing the kidney, often after previous dilatation, undergoes atrophy and shrinks, so that it may be reduced to little more than a dense fibroid layer closely embracing the calculus (1892, 1893). Around such a kidney the fatty capsule is often considerably increased in thickness (1893). The irritation of a stone in the pelvis may occasion the formation of small vascular papillary outgrowths in the mucous membrane (1888), and in rare instances a calculus is associated with, and perhaps causes, the development of a malignant renal tumour (1878). It very frequently happens that the presence of a calculus in the kidney is complicated by microbic infection. As a result of this, suppuration occurs in the pelvis and renal substance (calculous pyelitis and pyelo-nephritis, 1895), and if at the same time there is obstruction of the ureter the kidney becomes dilated into a large sacculated cavity filled with pus (calculous pyonephrosis, 1908, 1910). These inflammatory changes in the kidney cause induration and thickening of the fatty capsule, which becomes inseparably blended with the renal capsule. In the later stages the abscess may extend from the kidney into the surrounding tissues and may burst into the colon or point in the loin; in other cases the kidney becomes very adherent to surrounding structures, of which the colon is one of the most important. In the removal of such kidneys the capsule must be opened and the gland, if possible, removed from within it.

The positions in the ureter at which a calculus is most likely to be arrested are the upper and lower extremities (1897, 1899, 1911) and the point at which it crosses the brim of the pelvis. The damage caused by the impaction of the stone may be followed by stricture, and in rare instances perforation of the tube with extravasation of urine may occur.

Many of the specimens illustrate the operations performed for renal calculus and its results. Calculi removed by *nephrolithotomy* are illustrated by Nos. 1883, 1884, 1900 to 1902; *nephrotomy* for calculus hydronephrosis and pyonephrosis is illustrated by Nos. 1904, 1909; and kidneys removed by *nephrectomy* for calculous disease are preserved in Nos. 1903, 1905 to 1909.

Nos. 1912 and 1913 are from a case of calculous suppression of urine.

1885. Portion of a kidney, one of the calices of which is completely filled by a small calculus. The renal tissue is apparently healthy. 2587

1886. A section of a kidney, together with part of the ureter. The pelvis is occupied by a conical stone 3·5 cm. in length; the surface of the stone is dark brown, and a small part, from which the surface has been removed, slate-coloured. Below the large calculus, several smaller ones lie in the upper end of the ureter. The calices are dilated and the pyramidal portion of the kidney absorbed. The remaining renal substance is most abundant at the upper part, and the thickness of the cortex varies from 5 mm. to 1 mm. The kidney measures 8 cm. in length; the capsule is thickened and adherent. 8916

From a man, aged 23, who died of heart disease. There was no history of any renal symptoms. (Dr. Roberts's *Case-books*, 1902, vol. i, p. 30.)

1887. The kidney of a child, in the pelvis of which there is an irregular conical calculus, the apex of which lies within the commencement of the ureter; its base is branched. Two of the calices are greatly dilated, one in the upper part of the specimen forming a sac about the size of a walnut, the other below being about half that size.

The papillæ lying within the dilated calices are flattened and the pyramids partly absorbed. The mucous membrane is thickened and has lost its natural smoothness. The calculus is of a dark brown colour; it is composed of alternating layers of pale and dark uric acid. 1358

From a child starved to death by the woman who had charge of her.

1888. A kidney of which the pelvis and its main divisions are completely filled by a smooth pale calculus. From the upper part of the calculus two or three low mammillated processes extend into the corresponding calices. The pyramidal portion of the kidney has been completely absorbed, and the dilated calices form a series of sacs, covered by the thinned cortical tissue. In four of the calices are small papillary growths resembling the villous growths of the bladder and stained a deep brown colour, probably by hæmorrhage. 1359

1889. A kidney in the pelvis and dilated calices of which there is a large branched calculus. The pelvis and calices are dilated, the pyramids completely absorbed and the cortex is thinned. The whole kidney is smaller than natural, in consequence of the contraction of the chronically inflamed renal tissue. The stone is composed chiefly of pale uric acid, darkly blood-stained on the surface; its lower part is encrusted with phosphates. 2108

From a man, aged 70, who had also a large uric-acid calculus in his bladder.

1890. A left kidney, in the pelvis of which is an oxalate of calcium calculus. The stone is triangular in outline and measures 3 cm. in length; it is beset with sharp projecting spines and is of a jet-black colour except where its surface is covered with a grey crystalline deposit through which only the tips of the black spines protrude. The calices of the kidney are uniformly dilated. The pyramids have been absorbed; the cortical substance appears to be normal.

1891. Half a kidney containing five uric acid calculi, the largest of which has been divided in order to display the laminated structure. The calculi occupy the dilated calices of the lower half of the kidney. The upper calices form with the dilated pelvis one large cavity, the mucous membrane of which is in parts the seat of a brownish deposit, probably of altered blood. The renal substance is thinned and indurated and the capsule unnaturally adherent. 1860

It is probable that the dilatation of the pelvis resulted from the presence of a calculus in the upper end of the ureter.

1892. A kidney, the pelvis and calices of which are nearly filled with calculi. A large calculus partially encrusted with phosphates occupies the pelvis, and eight smaller calculi lie in the dilated calices. A very thin layer only of indurated renal substance remains. 756

1893. A shrunken kidney, containing numerous large irregular calculi, and surrounded by the indurated adipose capsule, in section. The largest stone occupies the pelvis and other smaller ones lie in spaces formed by the dilated calices. No traces of the renal substance are recognisable, so that the stones are embedded in a mass of dense fibro-fatty tissue 12 cm. in length and 7 cm. in breadth. 7314

From a woman, aged 46, who was admitted into U. C. H., under the care of Mr. Barker, on Nov. 6, 1894. She had experienced pain in the left loin and extending down the thigh since Oct. 1893. On admission there was a large fluctuating tumour in the left renal region. On Nov. 15 an abscess containing fetid pus was opened by a lumbar incision; the abscess was probably perirenal. Death occurred on Nov. 18. The right kidney was sacculated.

The right breast had been removed for duct-carcinoma in Jan. 1891 (Surg. Reg. Rep. 1891, p. 244, No. 256). The left breast had been removed for cystic degeneration in June 1894. (Mr. Barker's *Case-books*, 1894, vol. i, pp. 632 & 814.)

1894. Part of a kidney injected and dried. The pelvis is completely filled with a calculus. The calculus is irregularly conical; its apex corresponds with the upper end of the ureter; its branched base with the dilated calices. 1360

From a male subject brought into the dissecting-room.

1895. A kidney affected with calculous pyelitis. It is enlarged and its surface lobulated. The capsule has been removed; on the exposed surface are several small yellowish elevations, apparently commencing abscesses. The renal pelvis is dilated; the pyramidal portion of the renal substance is in great measure absorbed, the calices being correspondingly enlarged. The cortex is, in some parts, thinned over the dilated calices. In two of the dilated calices a calculus has been deposited. The mucous membrane of the pelvis is thickened and superficially ulcerated. Several smaller calculi were originally present in the renal pelvis. 1347

1896. An enlarged kidney, the pelvis of which is occupied by an irregular calculus. A process of the calculus extends into a large sac (shown on the back of the preparation) resulting from dilatation of the calices. A second smaller calculus lies in a sac below the renal pelvis. The mucous membrane in the several dilated parts is smooth and free from ulceration.

The pyramids are everywhere completely absorbed. In the lowest and most dilated part of the kidney the renal substance is thinned. 3286

1897. A right kidney and ureter, together with the corresponding half of the bladder and prostate. A calculus is impacted in the lower end of the ureter. The calculus is irregular in shape, and measures 2 cm. in length; its lower end is 2·5 cm. above the point at which the ureter enters the wall of the bladder. In its whole length above the stone, the ureter is dilated and its wall thickened. The kidney measures 10 cm. in length; the pelvis and calices are dilated and the renal substance reduced to a very thin layer. 7798

From a man, aged 46, who was admitted into U. C. H. under the care of Dr. Crocker, on March 24, 1897, for Pityriasis rubra. There was a history of pain in the back and side, vomiting, headache and increased frequency of micturition since Nov. 1896; the skin eruption had been present for four weeks. The urine was diminished in amount and contained pus. Death occurred from uræmia on April 19. There were old tuberculous foci in the lungs. The left kidney weighed 3½ ounces and was fibroid. The distended right kidney was full of thick pus. (Pernet, British Journ. of Dermatology, 1898, vol. x. p. 461.)

1898. A bladder and prostate together with the lower ends of the ureters, the bladder having been opened in front in order to display the extremity of a large calculus, which is impacted in the extremity of the right ureter, which has also been opened. The calculus is irregular and from it a branch projects through the ureteral orifice and presents on the inner surface of the bladder-wall. The part of the ureter which is occupied by the stone is dilated into a thick-walled sac closely embracing the calculus and measuring 3·5 cm. in its greatest diameter. The indurated tissues surrounding it have been separated by dissection. Above the stone the right ureter is moderately dilated and thickened. The left ureter is dilated and slightly thickened. The mucous membrane of the bladder is thickened but the muscular coat is not appreciably hypertrophied. The prostate is enlarged. 6863

There is no history to the specimen. The kidney is preserved in No. 1877.

1899. A uterus and its appendages, together with part of the vagina and bladder and the lower extremity of the right ureter. In the latter is a cylindrical stone measuring nearly 3 cm. in length and 13 mm. in its greatest diameter. The surface of the calculus is dark brown in colour, and its lower extremity is exposed in the bladder in the slightly dilated orifice of the ureter. The wall of the ureter is thickened. 6614

There is no history to the specimen.

1900. Half of a small heart-shaped calculus removed by nephro-lithotomy. It measures 18 mm. from base to apex and the whole stone weighed 29 grains. It is composed of uric acid and phosphates. (See No. 1901.)

1901. Two large calculi and several smaller fragments removed by operation from the kidney. One of the two large calculi measures 5·5 cm. in length and is irregularly branched; the other is irregular and facetted but not distinctly branched.

The calculi are composed of uric acid which is almost completely covered with a thin layer of chalky phosphates and together weighed 1480 grains. (See No. 1902.) 6848

1902. One large and one small calculus removed at a third operation from the same case as the two preceding specimens. The large calculus presents two irregular branches and a fractured surface from which another has been detached. One of the branches presents a club-shaped, coral-like extremity; the stone is of a yellowish-brown colour and is imperfectly covered with a white chalky layer. The small stone is facetted. (See No. 1903.) 7652

1903. The left kidney removed by operation from the same case as the preceding three specimens. It measures 11 cm. in length and 5 cm. in thickness; its interior is irregularly dilated and the renal substance indurated and much reduced in thickness. Near the lower end, on the outer aspect of the kidney, is a deep depression in which a renal fistula terminated; below this constriction the inferior extremity of the kidney forms a lobulated sac, containing an irregularly oval uric acid calculus nearly 2 cm. in length. 7758

From a man, aged 19, who was admitted into U. C. H. under the care of Mr. Beck, July 22, 1881; he had suffered from occasional attacks of pain in the left loin for eleven years. One year before admission he had a sudden pain in the loin, followed by hæmaturia, and from that time forward all his symptoms increased in severity, and his life became almost unbearable. On admission there was great frequency of micturition with pain after passing water; the urine was alkaline, turbid, with a trace of pus, and amounted to 40 oz. daily. Rest and other treatment having been useless, on Aug. 16 Mr. Beck cut down upon the kidney from the loin, and explored it with a needle; a stone was immediately felt. An incision was then made through the outer border of the renal substance and the wound expanded with polypus-forceps; the stone was easily extracted with a pair of sequestrum-forceps (No. 1900). There was free bleeding at first, but it speedily ceased. There was little shock; vomiting continued for some hours; no urine came from the wound for seven days, all passing by the ureter; then it flowed from the wound for four days, when it ceased finally. The patient sat up in bed on the 21st day after the operation, left his bed on the 28th day, and left the hospital on the 35th day. (Clin. Soc. Trans. vol. xv, 1882, p. 103.) This was the first operation of nephrolithotomy performed at U. C. H.

For four years after the operation the patient remained free from symptoms. The pain then returned and after several months two small stones were passed *per urethram*. This was followed by considerable relief, but later there was a return of severe pain in the left loin with increased frequency of micturition. On April 14, 1892, the patient was readmitted under the care of Mr. Godlee; there was tenderness on pressure over the left kidney, the lower end of which could be felt; the urine contained a large quantity of pus and a trace of blood. On April 21 the left kidney was exposed through the scar of the previous operation and the stones preserved in No. 1901 removed. The wound was healed when the patient left the hospital on June 18 (Mr. Beck and Mr. Godlee's *Casebooks*, 1892, vol. i, p. 582). During the next two years the patient remained quite well, after which symptoms, similar to those before experienced, returned, and on June 30, 1896, the patient was again admitted to the hospital under the care of Mr. Godlee. On July 21, the left kidney was again exposed and the calculi preserved in No. 1902, with other smaller fragments, removed. There was still a small renal fistula in the loin, when the patient was discharged on Sept. 19.

In February 1897 the patient was readmitted to the hospital with recurrence of the symptoms; the small renal fistula still remained. A stone in the lower end of the kidney was detected by radiography. Lumbar nephrectomy was performed by Mr. Godlee, the kidney being enucleated from its capsule. The patient left the hospital on the 38th day, the wound being nearly healed. (Surg. Reg. Rep. 1897, p. 52, Nos. 1426 & 311.)

1904. A right kidney, shrunken after the drainage of a calculous pyonephrosis. The anterior part of the kidney has been removed in order to display a small calculus which completely fills the cavity of the pelvis, the opening of the ureter into the latter being indicated by a glass rod. Communicating with the pelvis are seen the dilated calices, the mucous membrane lining which is superficially ulcerated. The renal substance is greatly reduced in thickness and in some parts is scarcely distinguishable from the indurated fatty capsule. In the upper part of the kidney, on its postero-external aspect is an incision 2·5 cm. in length, through which a piece of glass has been passed into the pelvis.

From a woman, aged 37, who was admitted into U. C. H. June 1882, under the care of Mr. Marshall. During the preceding year she had suffered from pain in the right lumbar region and groin, with frequent and painful micturition. On admission there was a large tender fluctuating tumour in the right renal region; the patient was thin and sweated at night.

Between June 20 and Oct. 19 the renal tumour was aspirated on five occasions and offensive pus withdrawn; on the last occasion a stone was felt with the point of the aspirator needle. On Oct. 20 the kidney was exposed in the loin and a free incision made into it; about half a pint of foul pus escaped; the stone could not be felt; a large drainage-tube was inserted into the kidney. The patient progressed favourably until Nov. 21 when at the menstrual period she was suddenly seized with severe pain at the lower part of the abdomen. Symptoms of general peritonitis followed and death occurred on Nov. 30. At the *post mortem* examination it was found that the peritonitis had originated in connection with a suppurating cyst of the right ovary. The left kidney weighed 9½ ounces.

1905. A kidney removed by operation for calculous pyelitis; together with the surrounding fat it measures 14 cm. in length. The renal pelvis is dilated and occupied by a calculus. The whole of the pyramidal portion of the kidney is absorbed, the calices forming superficially ulcerated sacculi varying in size from a pigeon's to that of a hen's egg. The enlarged calices are filled with branched irregular calculi, composed of uric acid. The renal substance is reduced a layer of indurated tissue, about 3 mm. in thickness. The kidney can be separated without much difficulty from its capsule; the latter is greatly thickened and inseparably blended with the surrounding fat, so as to form a dense mass about 1·5 cm. in thickness.

From a woman aged 57, who was admitted into U. C. H., June 13, 1881. She had passed a small stone 26 years previously. During the 3 months before admission there had been pain in the back and right loin, with increased frequency of micturition, the urine being thick and milky. On admission the patient was in fairly good health; there was a large tumour in the right renal region, at the lower and anterior part of which was a prominence harder than the rest; the urine was acid and contained pus. Under chloroform the tumour was punctured from the loin with an aspirator-needle and the stone felt. On July 15 abdominal nephrectomy was performed through a median incision. Death occurred 24 hours later, apparently from suppression of urine. At the *post mortem* examination the ligature on the renal vein was found to be so close to the vena cava that it puckered its walls; there was a small rent, $\frac{1}{8}$ inch long just above the entrance of the renal vein, from which no hæmorrhage had occurred. The left kidney was healthy. (Barlow and Godlee, Clin. Soc. Trans. 1882, vol. xv, p. 134.)

1906. A kidney removed by operation for calculous pyonephrosis. The kidney has been enucleated from its capsule, which, together with the thickened surrounding fat, was left behind at the operation. The kidney measures about 13 cm. in its vertical diameter, and 10 cm. in each of its other axes; its surface is smooth and lobulated; its interior is greatly enlarged from chronic distention, so as to form a loculated cavity surrounded by the greatly thinned renal substance.

The pelvis has been laid open; it is occupied in its lower part by a smooth dark-brown calculus about 6 mm. in diameter.

From a woman, aged 32, who was admitted into U. C. H., June 16, 1880. She had suffered at times from renal colic since the age of 5 years; the pain had recently unfitted her for heavy work. In May 1880 a tumour was first noticed and it rapidly increased. On admission the left renal region was occupied by a large smooth fluctuating tumour; the frequency of micturition was increased; the urine was smoky and contained pus. On July 1 the tumour, was aspirated and a pint of pus withdrawn. On July 5 lumbar nephrectomy was performed. Death occurred from shock 3 hours later. (Barker, Med.-Chir. Trans. vol. lxiv, p. 257.)

1907. A right kidney removed by operation for calculous pyonephrosis. It measures 19 cm. in length and 12 cm. in width. The kidney is lobulated and is converted into a number of intercommunicating cavities, which have been exposed by the removal of parts of the distended renal substance by which they are bounded; several of the spaces contain uric acid calculi. The largest cavity which has a maximum diameter of 9 cm., and is very thin-walled, occupies the lower end of the kidney; it contains several irregular calculi. The cavity which occupies the upper extremity of the kidney is surrounded by a thick layer of renal substance and contains a large, smooth, branched calculus, 6 cm. across. The pelvis is moderately dilated and has been laid open in order to display an irregular elongated calculus, 7 cm. in length, by which it is filled. 8430

From a middle-aged man who for many years had suffered from enlargement of the right kidney and pyuria. Lumbar nephrectomy was performed by Mr. Raymond Johnson. Death occurred from shock a few hours after the operation.

1908. A right kidney removed by operation for pyonephrosis resulting from the presence of a calculus in the ureter. The part of the latter removed measures 10 cm. in length; at a point 4 cm. below the kidney the ureter is narrowed so as only to admit an ordinary probe; below this point it is dilated and contains a darkly stained calculus, 2·3 cm. in length and 17 mm. in breadth. The kidney is converted into a fibrous sac 18 cm. in length and 11 cm. in breadth. Internally the sac is subdivided, especially in the lower part, by fibrous septa indicating the boundaries of the dilated calices of which the sac is composed. The opening of the ureter into the pelvis has a diameter of 3 mm. 8670

From a woman, aged 26, who was admitted into the Samaritan Hospital on Feb. 4, 1901, under the care of Mr. Meredith. The first symptom was an attack of renal pain in the right side with slight hæmaturia in Sept. 1898. Subsequent attacks of pain occurred in June 1899, Jan. 1900, and June 1900, the last being accompanied with pyuria. After the patient's confinement in Sept. 1900, there was persistent pain in the right loin, with pyuria. On admission there was a movable fluctuating tumour in the right renal region; the urine was alkaline and contained much pus. Abdominal nephrectomy was performed on Feb. 6; the kidney contained 25 ounces of pus and some small stones in addition to that which was impacted in the ureter. The patient made an uninterrupted recovery.

1909. A kidney removed by operation for the cure of a renal fistula resulting from a previous operation for calculous hydronephrosis. The dilated pelvis of the kidney has a maximum diameter of 5 cm., and communicating with it are seen the previously dilated but now shrunken calices, the largest of which is situated at the upper end of the organ. The lining of the pelvis is thick and, especially at the lower part, coarsely velvety. A considerable amount of renal tissue remains, the length of the kidney being 8 cm. At the middle of its outer border is the opening of the renal fistula which communicates with the dilated pelvis. 6803

From a woman, aged 32, who was admitted into U. C. H. under the care of Mr. Beck, Jan. 4, 1892. Four years previously she had been operated on for calculous hydronephrosis, 3 stones being removed (Surg. Reg. Rep. 1888, p. 64, No. 582). On readmission, the renal fistula in the right loin still discharged considerable quantities of urine. On Jan. 7 lumbar nephrectomy was performed. The patient left the hospital on Feb. 18, and when seen later the wound had quite healed. (Mr. Beck and Mr. Godlee's *Case-books*, 1892, vol. i, p. 564.)

1910. A right kidney, the seat of calculous pyonephrosis, in section. The kidney is lobulated, and measures 15 cm. in length and 9 cm. in breadth. The pelvis is occupied by a large calculus the outline of which is roughly triangular, each side measuring about 4·5 cm.; from the upper angle of the calculus a finely spiculated branch projects into one of the dilated calices. Around the pelvis, which is completely filled by the calculus, are seen the cavities of the greatly dilated calices, the lining of which is thick and opaque. The maximum thickness of the renal substance is 6 mm. The ureter is dilated, especially in the upper half of its length, and for a distance of 6 cm. below the kidney its wall is much thickened and surrounded by indurated fat. The calculus is composed of uric acid covered with a layer of phosphates. (See No. 1911.) 8668

1911. The left kidney and ureter from the same case as the preceding specimen. The ureter is blocked by a cylindrical uric acid calculus, 4·5 cm. in length, the upper end of which is 6 cm. below the pelvis of the kidney. In the position of the calculus the wall of the ureter is fibroid and thickened. Midway between the upper end of the stone and the pelvis of the kidney the lumen of the ureter is completely obliterated for a distance of 15 mm. The kidney is hydronephrotic and measures 13 cm. in length; it is converted into a fibrous sac the interior of which is composed of the distended pelvis surrounded by a series of separate compartments corresponding with the dilated calices. 8668

From a woman, aged 39, who was in the Soho Hospital for Women, under the care of Mr. Douglas Drew. She had suffered from profuse hæmaturia for 10 months, with very slight dragging pain in the right loin. The urine was alkaline and offensive and contained large quantities of blood and pus; the average daily amount was 30 ounces. There was a large tumour in the right renal region and the left kidney appeared to be slightly enlarged. Death occurred suddenly from uræmia.

1912. The shrunken right kidney, together with the ureter which contains two calculi, from a case of calculous suppression of urine. The kidney, of which a section has been made, measures 8·5 cm. in length; in its lower half the renal substance is atrophied and fibroid, and the calices, which are not dilated, are embedded in the fat of the sinus; in the upper half the calices are dilated. At a distance of 12 cm. below the kidney the ureter is blocked by an irregular calculus, 1·5 cm. in length; a second very small calculus blocks the ureter at a distance of 2 cm. above its lower end. Between the two calculi the ureter is reduced to the size of a vas deferens; between the larger calculus and the kidney the wall of the ureter is much thickened, but its lumen contracted. (See No. 1913.) 8057

1913. Half the left kidney, together with the ureter, from the same case as the preceding specimen. The kidney is hypertrophied, measuring 14·5 cm. in length and the cortex 10 mm. in thickness; the calices are slightly dilated and the papillæ slightly flattened. The area in the middle third of the kidney, indicated by two glass rods, is that through which an incision had been made through the renal substance into the pelvis. The ureter is thickened, and at a point 6 cm. above its lower extremity was blocked by a calculus as large as a hazel-nut. 8057

From a woman, aged 52, who was admitted into U. C. H., under the care of Mr. Heath, June 11, 1898. The patient had passed no urine for 3 days, the onset of the anuria being accompanied with pain in the left side of the back and vomiting. There was a history of a similar attack 12 months previously lasting 1 day, followed by the passage of two small stones. On admission there was some puffiness of the eyelids and some pitting over the sacrum, but no œdema elsewhere; there was no headache or mental disturbance; there was tenderness in the left renal region. Temperature, 98°·6; respiration 20; pulse 92. Nothing abnormal was detected on vaginal examination. A catheter was passed and the bladder found to be empty. Salines were administered, and the renal region dry-cupped and poulticed without effect. On the following morning the patient was very drowsy, and there were marked muscular twitchings. Operation was performed at 10.30 A.M.: the urethra was dilated, and the bladder and lower ends of ureters examined with negative result; the left kidney was exposed from the loin and incised through the outer border into the pelvis; about 4 ounces of blood-stained urine escaped; a stone was detected in the lower end of the ureter with a probe, but further interference was abandoned on account of the patient's collapsed condition. Death occurred 22 hours after the operation. (Surg. Reg. Rep. 1898, p. 100, No. 1123.)

1914. Half a left kidney in which hydronephrosis has resulted from the presence of a calculus in the pelvis, and in which extensive hæmorrhage has subsequently occurred. The kidney measures 17 cm. in length and 11 cm. in breadth; it consists of a thick-walled sac almost completely filled with coagulum in parts distinctly laminated. Especially in the lower half of the kidney the outlines of the distended calices, into which the hæmorrhage has occurred, can be recognised. The calculus lies embedded in the clot which fills the pelvis; it is irregularly dumb-bell shaped and 4·5 cm. in length. The upper end of the ureter and adjacent part of the pelvis present an irregularly papillary surface. 7904

Microscopic Structure.—The upper part of the ureter and the pelvis show great thickening of the wall, with branching fibrous processes springing from the inner surface, containing large blood-vessels and covered with proliferated epithelium, except at their tips where the epithelium has been shed. There is no epithelial ingrowth into the wall of the ureter or pelvis.

From a man, aged 44, admitted into U. C. H., Oct. 1897, suffering from delirium tremens and severe hæmaturia. There was a history of aching pain across the loins and an attack of hæmaturia lasting a week, 6 months previously. On admission a large tumour occupied the left renal region; the urine contained much blood. Death occurred on Oct. 5; the right kidney was healthy. (Bradford, Trans. Path. Soc. 1898, vol. xlix, p. 171.)

TUBERCULOUS DISEASE OF THE KIDNEY.

Tuberculous disease of the kidney is met with in the miliary form, as part of general tuberculosis (1914 A), or as caseous deposits. The latter form alone is of surgical importance. The disease may be primary in and limited to the kidney, or it may be associated with similar disease in the lower parts of the genito-urinary tract (1915); in the latter case both kidneys are often involved.

In the caseating form of renal tuberculosis the disease begins, as a rule, in the cortex; large caseous masses are gradually developed, extending into the pyramids corresponding to the parts of the cortex affected (1915). The caseous masses undergo softening and disintegration, the papillæ are destroyed, and the disintegrated products are discharged with the urine. The kidney is now the seat, in part or throughout, of a number of cavities lined by caseous matter and communicating with the pelvis, to which the disease itself extends (*tuberculous pyelitis*). At a still later stage the kidney and pelvis may be transformed into a large loculated abscess-cavity (*tuberculous pyonephrosis*, 1916). Whilst these changes are proceeding the remaining cortical tissue becomes opaque and tough, the capsule is thickened and the surrounding fat is indurated and adherent to the capsule. Occasionally suppuration extends into the tissues outside the kidney (*perirenal abscess*, 1915). At any stage the disease may be arrested; the remains of the kidney then shrink and may finally be represented by little more than a dense fibrous mass, in which are embedded the dried and often calcified remains of the tuberculous tissue.

1914 A. Half of one of the kidneys of a child. Large numbers of miliary tubercles are seen upon the surface, from which the capsule has been removed; and others are situated in the renal substance. 9197

From a case of general miliary tuberculosis.

1915. The left kidney and ureter, together with the prostate, vesiculæ seminales and part of the bladder, from a case of tuberculous disease of the genito-urinary tract. The kidney, of which a section has been made, is 14 cm. in length and 7 cm. in breadth. The cut surface is divided into lobes, most of which correspond with the pyramids and their appertaining cortex, the lobes being clearly indicated on the external surface of the kidney. Each lobe consists of a dense, yellow mass the centre of which, except in the case of some of the smallest masses, has softened so as to form an irregular central cavity. The tuberculous masses vary much in size and shape, but several are wedge-shaped and have their larger extremities at the surface of the kidney; the masses are separated by dense fibrous septa, and those which do not reach the surface of the kidney are covered by a thin layer of fibroid renal substance. In the upper end of the kidney, one of the tuberculous foci has completely softened so as to form an irregular abscess-cavity.

The capsule has been partly separated from the anterior surface of the kidney, and in so doing the cortical substance has in one place been torn, thus exposing a caseous deposit beneath it. A little below this is a prominent nodule over which the capsule was adherent both to the kidney and to the colon, so that in separating it a round hole has been torn in the gut. On the posterior surface of the kidney the capsule is thickened and has been separated for a short distance; over a considerable area it is wanting in the situation of a perirenal abscess, which was opened during life. The mucous membrane of the renal pelvis and ureter is swollen and ulcerated; the lower end of the right ureter is healthy. The mucous membrane of the part of the bladder preserved in the specimen is extensively ulcerated. The left lobe of the prostate and the left vesicula seminalis are enlarged; the section of the prostate displays solid caseous deposits; on the divided surface of the vesicula seminalis are seen the sections of the tube, which contains soft caseous matter; the vas is much enlarged and presents tuberculous deposits around the lumen. The right vesicula seminalis and vas are healthy; there are a few small caseous deposits in the right lobe of the prostate.

There is no history to the specimen.

1916. A right kidney, the seat of tuberculous pyonephrosis, upon which nephrotomy had been performed. The kidney is ovoidal in shape, and measures 12 cm. in length; the interior is loculated and consists of numerous irregular cavities resulting from the breaking down of tuberculous deposits and the discharge of the softened matter by the ureter. The cavities are separated by dense fibroid septa and are lined with an irregular caseous layer. No renal substance can be recognised. The capsule is thickened and adherent, and on the posterior and outer surface the opening made into the kidney during life is indicated by a piece of glass rod. The mucous membrane of the ureter is irregularly thickened and ulcerated. 5498

From a woman, aged 32, who was admitted into U. C. H. under the care of Dr. Wilson Fox, June 16, 1880. There was a long history of pain in the left side of the abdomen, where a tumour was first noticed a month before admission. On admission, the left lumbar region was occupied by a large elastic tumour; the urine was acid and contained a deposit of pus cells and red blood-corpuscles; the temperature varied between 98° and 101°·8. On July 2 the tumour was aspirated by Mr. Barker, and 20 ounces of fetid pus withdrawn. On July 5 nephrectomy was performed.

1917. Half a kidney, together with the ureter, which has been laid open to display a patch of tuberculous disease. The kidney is healthy. The disease of the ureter is situated 9 cm. below its upper extremity; it takes the form of an ulcer involving the whole circumference for a distance of 2·5 cm. The surface of the ulcer is irregular, and in its base the mucous membrane and submucous tissue have a thickness of 4 mm. 7644

From a patient who died of general tuberculosis.
The bladder is preserved in No. 1963.

Tumours of the Kidney.

The most common tumour of the kidney is *Sarcoma*. The tumour may originate in and infiltrate the renal substance (1920), or it may begin in the sinus, displacing rather than infiltrating the renal substance (1918). The tumour is most commonly of the round-cell variety, but other forms, especially the spindle-cell, occur. Sarcoma of the kidney is the commonest cause of abdominal tumour in early life, and may be bilateral; in children the tumour usually begins in the renal sinus, and may present a mixed structure, containing transversely striated spindles like muscle-fibres, and epithelium-lined spaces.

Carcinoma of the kidney may originate in the renal substance or in the mucous membrane of the pelvis and calices. The tumours originating in the renal substance are the more common, and are of the spheroidal cell variety (1921); those beginning in the pelvis or calices may assume a villous form (1922). Carcinoma of the kidney-substance may be diffuse or localised. Calculus and carcinoma of the kidney are occasionally met with in association (1878).

Malignant tumours of the kidney may involve surrounding structures, such as the colon and liver; in the later stages glandular infection occurs, and dissemination occurs through the blood-stream, masses of the growth not uncommonly being found projecting into the renal vein and vena cava (1317).

Simple papilloma is occasionally met with in the renal pelvis; it may cause hæmaturia. Small villous growths in the mucous membrane of the pelvis may be associated with, and apparently caused by, the presence of a renal calculus (1888).

Adenoma of the kidney is met with in the form of small isolated and encapsuled tumours which are usually not productive of symptoms. Some of the tumours of the kidney met with in early life, resembling sarcomata in appearance, present an adenomatous structure (1925).

Adrenal Tumours.—These tumours undoubtedly originate in isolated fragments of adrenal tissue situated in or upon the kidney. They are situated in the upper part of the kidney; they are encapsuled and lobulated. The tumour-substance presents a yellowish colour, and is frequently the seat of hæmorrhages and areas of degeneration (1923). The chief features of the microscopic structure of these tumours is the presence of solid columns of spheroidal or polyhedral cells separated by a scanty but vascular stroma; the tumour-cells are mostly filled with fat globules (1923, 1924). Tumours of this structure may for a long period pursue a simple course, but they may ultimately infiltrate the surrounding structures and cause secondary deposits.

The tumours of the kidney preserved in this Series include only those removed by operation. Other specimens, including cystic disease, will be found in the Medical Series.

1918. The left kidney of a child, divided vertically to display a sarcomatous tumour. The kidney is enlarged and measures 10 cm. in length. The tumour occupies the sinus and has extended into the renal substance, only a thin layer of the cortex remaining over the central part. At the upper limit of the growth one of the calices, slightly distended and with its papilla flattened, is seen in section. In the hilum the tumour projects chiefly in front, where a lobulated mass of the growth surrounds the renal vessels; the upper end of the ureter lies on the posterior aspect of this part of the tumour. The cut surface of the tumour is nearly white in colour and intersected by a delicate fibrous reticulum. 9364

Microscopic Structure.—The tumour is a small round-cell sarcoma.

From a boy, aged 3 years, who was admitted into U. C. H., under the care of Mr. Raymond Johnson, in Sept. 1903. The presence of an abdominal tumour had been noticed 6 weeks previously; some loss of flesh had occurred, and on one occasion the child had passed a worm-like clot of blood in the urine. Abdominal nephrectomy was performed on Sept. 9; no secondary deposits were detected at the operation. After a period of prolonged shock the child progressed favourably, and left the hospital on Sept. 28. In January 1904, a mass of recurrent growth could be felt in the left side of the abdomen.

1919. The posterior half of a right kidney, removed by operation for sarcoma. It measures 15 cm. in length, and before section was about 11 cm. in each of its other diameters. The surface of the kidney is rather more lobulated in the lower than the upper half; the capsule is in all parts normal. On the divided surface the upper extremity is seen to be normal, but in the rest of its extent the renal substance can only be recognised as an irregular layer on the surface of the tumour. The latter consists of a soft friable substance, intersected by an open fibrous meshwork. Internally the tumour fills up the sinus, displacing the pelvis towards the middle line. One of the lower calices is distended by a soft oval mass, 7 cm. in diameter, consisting chiefly of blood effused into the tumour-substance; the mass is surrounded by a tough fibrous capsule derived from the mucous membrane of the calix.

Microscopic Structure.—The tumour is a small round-cell sarcoma. The surrounding kidney-substance is fibroid and extends in the form of septa into the substance of the growth.

From a woman, aged 21, who was admitted into U. C. H., under the care of Mr. Barker, Nov. 3, 1879. She had had slight pain in the right loin for 8 months, and 3 months before admission had a very severe attack of pain followed by vomiting and blood in the urine. A small tumour was then felt in the abdomen. On admission a movable tumour was felt in the right renal region; there was constant hæmaturia with severe pain and frequent vomiting. The kidney was removed through a median abdominal incision on Dec. 25, 1879; the peritoneum was torn through at the outer side of the colon and the tumour freed without great difficulty; the pedicle was tied with silk, and the ureter tied separately; there was little hæmorrhage. Death occurred 45½ hours after the operation with symptoms of cardiac thrombosis. At the *post mortem* examination a large *ante mortem* clot was found in the right ventricle, extending into the divisions of the pulmonary artery; there were secondary growths in the glands of the hilum of the kidney and in the lung; there was no peritonitis or hæmorrhage. (Barker, Med.-Chir. Trans. vol. lxiii, 1880, p. 191.)

1920. A section of the left kidney of a child, together with a large sarcomatous tumour growing from its upper extremity. The part of the kidney which is not involved in the tumour is normal. The tumour measures 15 cm. in length, and is irregularly oval in shape; the surface is slightly lobulated, invested by a fibrous capsule, continuous with the capsule of the kidney, and marked by a deep transverse groove. The cut surface of the tumour is intersected by a considerable amount of fibrous tissue, the tumour-substance being in some parts almost homogeneous, in others finely granular, and in a few parts presenting semitranslucent areas. 8807

Microscopic Structure.—The tumour is a round-cell sarcoma. The cells are arranged in large lobed masses, separated by fibrous septa. The line of demarcation between the tumour and the kidney-substance is well defined.

From a female child, aged 2½, who was admitted into U. C. H., under the care of Mr. Bilton Pollard, on June 23, 1901, on account of gradually increasing abdominal distension of six months' duration. On admission the child was pale and thin; the abdomen was enlarged by a lobulated tumour, as large as a fœtal head, projecting forwards from the left loin. There was no blood in the urine. Abdominal nephrectomy was performed on June 24. The operation was followed by severe shock and persistent vomiting. Death occurred on July 10. There was no autopsy.

1921. A right kidney removed by operation for carcinoma and divided vertically. The kidney measures 14 cm. in length and 8 cm. in breadth. The surface of the kidney is lobulated and invested in all parts by the capsule. The section shows that the renal substance is almost entirely replaced by the tumour; a small part, including one of the pyramids, can however be recognised at the upper end of the specimen. The pelvis of the kidney is partly occupied by a fungating mass of the growth and several of the calices are seen to be filled with growth. The tumour-substance is granular and friable, and broken up into well-defined irregular areas by branching septa of fibrous tissue. 8068

Microscopic Structure.—The tumour is a carcinoma. In some parts the cell-masses are irregularly mixed with a cellular stoma, and in other parts are spaces bounded by delicate trabeculæ, covered with a single layer of irregular epithelium.

From a man, aged 48, who was admitted into U. C. H., under the care of Mr. Heath, in 1898. Fifteen months previously the patient had an attack of jaundice; for three weeks before admission there had been urgent vomiting, and for one week blood in the urine. On admission there was still slight jaundice and slight œdema of the ankles; a tumour could be felt in the right renal region; the urine contained a trace of albumen, but no blood whilst the patient was in the hospital. The right kidney was removed through an incision in the right linea semilunaris; during the operation a soft nodule of growth on the surface of the kidney was torn and some brain-like matter escaped into the wound. The patient recovered from the operation, but died six months later with recurrence in the scar. (Surg. Reg. Rep. 1898, p. 102, No. 1280.)

1922. A left kidney and ureter in section, together with the bladder which has been laid open in front. The kidney is dilated, and measures 14 cm. in length. The dilatation of the calices is most marked in the upper part of the organ, where the cortex is greatly reduced in thickness. The lining membrane of the dilated calices is thickly covered with delicate papillomatous growths; the pelvis is similarly but less markedly affected. In the lower part of the kidney more of the renal substance remains and presents numerous nodules of spongy growth. The fatty capsule is indurated and adherent, and united with it posteriorly are part of the abdominal aorta and a chain of enlarged lymphatic glands; one of the latter on section is seen to be infiltrated with new growth in which are numerous cysts, the largest at the lower end of the gland presenting several minute papillary outgrowths on its inner surface. The ureter, except at its junction with the pelvis, is dilated, and along its whole length the mucous membrane is beset with delicate pedunculated villous growths. The bladder is small and somewhat fasciculated, and growing around the left ureteral orifice is a papillomatous growth, which in the recent state was of a red colour. 7694

Microscopic Structure.—The tumour of the kidney is a villous carcinoma, but the tumours of the ureter and bladder appear to be simple papillomata. A section of one of the nodules of growth in the kidney-substance presents alveoli, some of which contain epithelium of the transitional type and others present small papillary ingrowths. The secondary deposits in the lymphatic glands present a similar structure.

From a man, aged 56, who was admitted into U. C. H., under the care of Mr. Barker, on July 24, 1896. For 3½ years he had suffered from attacks of pain resembling renal colic, accompanied with the passage of blood-clots in the urine. Two months before admission a tumour was detected in the left renal region. On admission the patient was anæmic and emaciated; there was a large elastic tumour in the left renal region; the urine contained blood. On July 30 nephrotomy was performed and nearly 2 pints of turbid urine evacuated. The kidney was drained with a large tube. On August 25, on account of imperfect drainage and elevation of temperature, the wound was opened up and a quantity of thick flaky lymph evacuated; although the presence of a growth was suspected it could not be detected with the finger. Death occurred on Nov. 11. The right kidney was somewhat enlarged but the pelvis and ureter were normal; there was a small nodule of growth on the under surface of the liver. (Drew, Trans. Path. Soc. vol. xlviii, 1897, p. 130.)

1923. A section of a left kidney removed by operation for an adrenal growth. The lower half of the kidney is normal, and the upper half is occupied by a very lobulated, irregularly rounded tumour about 8 cm. in diameter. The prominent lobules on the surface of the growth are invested by a fibrous capsule continuous with that of the kidney, and in some places a thin layer of renal substance can be recognised upon the surface of the growth. On the divided surface of the specimen the line of demarcation between the tumour and kidney-substance is well defined, the convex border of the growth being formed by an extension of the capsule which covers its superficial surface. The mucous membrane of the upper part of the pelvis of the kidney is stretched over that portion of the growth which projects into the upper part of the sinus. The cut surface of the tumour is subdivided into a number of lobules surrounded by fibrous capsules, and in the central part of the tumour is a considerable area composed of semitranslucent fibrous tissue. Some of the lobules of tumour-substance are of a bright yellow colour, others are entirely hæmorrhagic, whilst others show a combination of the two appearances. 8339

Microscopic Structure.—The tumour is an adrenal growth. It consists of elongated alveoli filled with cells. In some of the alveoli the cells have granular protoplasm, in others the cells are distended with fat-globules. In places large thin-walled blood-sinuses are present between the alveoli and there are large extravasations of blood.

From a man, aged 60, who had suffered from several attacks of hæmaturia during a period of 7 years, associated with a feeling of uneasiness in the left renal region. Nephrectomy was performed by Mr. Godlee. The patient died of pneumonia a few days after the operation.

1924. A large tumour of the right kidney in section. The tumour is irregularly rounded in outline and measures 16 cm. in its vertical diameter. The capsule of the kidney, which appears to have extended over the surface of the tumour, has been removed. The main mass of the tumour projects from the upper extremity of the kidney, the substance of the latter being traceable for some distance over its surface. The cut surface of the tumour shows in its upper and outer part a cavity 7 cm. in diameter surrounded by irregular, hyaline fibrous tissue. With the exception of a few minute cysts the rest of the tumour is solid and for the most part presents a semitranslucent trabeculated structure, containing pale yellow areas, the result of degeneration. The true structure of the tumour is best seen in the periphery of the section, especially in the neighbourhood of the remains of the kidney; it is lobulated, some of the lobules consisting of pale yellow growth and others being to a large extent hæmorrhagic. Masses of the growth occupy the pyramidal portion of the upper half of the remains of the kidney, and project into the calices; these deposits are distinctly encapsuled. 8696

Microscopic Structure.—The tumour is an adrenal growth, identical in structure with the preceding specimen (No. 1923).

From a woman in whom there had been enlargement of the right kidney for 4 or 5 years; the only other symptom was occasional hæmaturia of a few months' duration. Abdominal nephrectomy was performed by Mr. Douglas Drew. There was very free bleeding from large veins passing from the tumour into the perirenal fat. Death occurred a few hours after the operation.

1925. A section of the left kidney of a child, removed by operation for tumour, and divided vertically. The tumour, which has a vertical diameter of 10 cm., involves the upper end of the kidney; its surface, which is everywhere invested with a fibrous capsule, from which the fatty capsule has been separated, is lobulated and its lower border is readily distinguishable from the surface of the unaltered lower portion of the kidney. On the cut surface of the specimen the line of demarcation between the tumour and the unaltered portion of the kidney is well-defined, although the two are intimately connected, the lower part of the tumour projecting downwards into the renal sinus to within 3 cm. of the lower end of the organ. The tumour-substance is soft and friable, yellowish white in colour except where stained by hæmorrhage, and divided into lobules by fibrous septa. 9028

Microscopic Structure.—The growth consists of lobules, separated by connective-tissue septa. The lobules are composed chiefly of irregular tubules lined with long columnar cells; the inner ends of the cells, which surround the lumen, are sharply defined, whilst the outer ends of the cells appear to lie directly on the surrounding stroma. In some parts similar columnar cells are arranged in a radiate manner without enclosing a central lumen. In other parts ill-defined cell-masses are intimately mixed up with the tubules. The tumour presents the structure of those to which the name adenoma is sometimes applied, but its simple nature is not certain.

From a girl, aged 9 years, who was admitted into U. C. H., under the care of Mr. Bucknall, July 10, 1902. A swelling in the left side of the abdomen, attended with aching pain, had been noticed for 5 months; there were no urinary symptoms. The patient was in good health. The tumour occupied the left hypochondrium, disappearing above beneath the ribs, and extending but slightly into the loin; below the tumour the kidney could be felt and was thought to be separate from it, so that the tumour was regarded as probably connected with the spleen. On July 14 the abdomen was opened through a median incision, and the tumour found to be connected with the upper end of the kidney; nephrectomy was performed. There was severe shock after the operation, but the child rapidly recovered and left the hospital on August 4. The patient died 18 months after the operation with extensive recurrence within the abdomen. (Sir Victor Horsley's *Case-books*, 1902, Dixon.)

1926. A section of a large sarcoma growing in connection with the left kidney. The tumour is globular and measures about 15 cm. in diameter; it is invested at all parts by a dense fibrous capsule and the cut surface, which is subdivided by fibrous septa, presents a soft yellowish-white tumour-substance with several extravasations of blood into it. The section of the kidney is readily recognised on the outer aspect of the tumour; it measures 7·5 cm. in length; it does not appear to be invaded by the growth, although the renal substance is partly spread out over its surface. The pelvis of the kidney is not invaded but is compressed by the portion of the tumour which occupies the sinus. In the latter the capsule of the kidney can be traced continuously into that of the tumour. 9156

Microscopic Structure.—The tumour is a small round-cell sarcoma, the masses of cells lying in an abundant finely reticular cellular stroma.

From a boy, aged 4 years, who was admitted into the Royal Hospital for Children and Women, October 7, 1901, on account of enlargement of the abdomen, which had been first noticed on Sept. 23. On August 5, after a fall in the street, he had suffered for several days from vomiting, and there was dulness on percussion with marked tenderness in the left lumbar region. From August 10 until his admission there were no definite symptoms, but the boy seemed weak and listless. There was no history of hæmaturia. On admission, the left half of the abdomen was nearly filled by a tumour which extended backwards into the loin. The superficial veins over the tumour were distended. The urine was normal. The tumour, which weighed 3 lb. 15 ounces, was removed by Mr. H. J. Curtis, by transperitoneal nephrectomy. There was persistent vomiting after the operation, and death occurred on the 15th day with signs of effusion into both sides of the chest. No secondary growths were found; the right kidney was normal. (Hawthorne and Curtis, Reports of the Society for the Study of Disease in Children, 1902, vol. ii.)

1927. A section of a left kidney removed by operation for a cystic tumour. The cystic portion of the tumour forms a large rounded projection from the lower and outer aspect of the kidney. In the section, the upper part of the growth, which has not undergone cystic change, projects upwards into the lower part of the renal sinus and is separated from the renal substance by a distinct fibrous capsule, continuous below with the wall of the cystic part of the tumour. The inner surface of the cyst is covered with a thin, irregular, yellowish-brown layer of tumour-substance. The solid part of the growth is opaque yellowish-white and marked with small areas of orange-yellow. 9013

Microscopic Structure.—Owing to the degeneration of the growth the microscopic structure cannot be determined.

From a woman, aged 55, who was admitted into U. C. H. in May, 1902. Since an attack of influenza in February she had suffered from pain in the back and waist and swelling of the abdomen. There were no urinary symptoms. There was a large tumour in the left renal region; the temperature during the fortnight after admission varied between about 102° at night and 99° in the morning. On May 29 Mr. Barker opened the abdomen by an incision in the left linea semilunaris, exposing a considerable fluctuating enlargement in the left kidney, which was thought to be probably a pyonephrosis; the abdominal incision was closed. On June 6, the kidney was again exposed by a lumbar incision and on incising it a considerable quantity of brownish-yellow semi-solid material was evacuated. The enlargement of the kidney being thus evidently due to a new growth, nephrectomy was performed. The elevation of temperature persisted after the operation, and death occurred on June 9. (Mr. Barker's *Case-books*, 1902, Hawkins.)

Hydronephrosis and Pyonephrosis.

Hydronephrosis results from an obstruction, usually incomplete and long continued, to the outflow of urine from the kidney. It may thus be due to widely different causes, amongst the most important of which are :—Obstructive diseases of the lower urinary tract, the pressure of pelvic and abdominal tumours on the ureter, calculi in the kidney or ureter, and twists and narrowings of the ureter in movable kidney, &c. Specimens illustrating almost every degree of dilatation of the kidney will be found in the preceding series. In the most advanced degree of hydronephrosis the kidney may be converted into a thick fibrous sac, while in other cases a considerable amount of secreting substance may remain.

Pyonephrosis differs from hydronephrosis only in the fact that the distended kidney, as the result of an infection, usually by way of the ureter, contains pus, or a mixture of pus and urine, instead of clear fluid. In some instances the infection of the kidney only occurs after hydronephrosis has been established, in other instances the infection is already present before the dilatation commences.

1928. A hydronephrotic right kidney in section, together with the ureter. The external dimensions of the kidney are not increased, but the interior is converted into a series of compartments separated by thin septa and communicating with the pelvis. The latter is considerably dilated. At the point where the pelvis joins the ureter the lumen of the tube is completely obliterated. There is no thickening at the seat of obstruction, but in the lower part of its length the ureter is enlarged and its wall thickened. 8156

From the dissecting-room. It is probable that the changes in the ureter have resulted from ulceration due to the presence of calculi.

INJURIES AND DISEASES OF THE URINARY BLADDER.

Injuries.

Wounds of the bladder may be produced by bullets or by sharp instruments penetrating it in the pubic region, or, in rare cases, through the rectum. The bladder is occasionally wounded in fractures of the pelvis.

Rupture of the bladder always occurs as the result of a blow on the lower part of the abdomen when the bladder is distended (1929–1932). The rent usually takes place through that part of the bladder-wall which is covered by peritoneum, and extravasation of urine occurs into the peritoneal cavity. The only successful treatment of this injury consists in opening the abdomen, suturing the rent in the bladder-wall and cleansing the peritoneal cavity.

Rupture of a healthy bladder never occurs from simple overdistension, since, before such an event could occur, the pressure in the kidneys would become sufficient to arrest secretion.

1929. A bladder with the prostate gland, recto-vesical pouch, and a small piece of the rectum, the bladder being laid open from the front.

In the superior wall of the bladder, near its summit and to the right of the middle line, is an irregularly oval rent, 3 cm. in length. Owing to slight retraction of the muscle around the rent, the margin is formed by the mucous membrane. From the left side of the opening a transverse tear extends through the peritoneum.

The lowest part of the recto-vesical pouch is coated with a thin layer of exudation.

The patient, a young man under the care of Mr. Samuel Cooper, was thrown in a wrestling match, his opponent's knee striking the hypogastric region. The bladder was full at the time. The patient tried to micturate immediately after the accident, but could only succeed in passing, with great pain, a small quantity of urine tinged with blood. A catheter was introduced, and a quantity of bloody urine withdrawn. Peritonitis supervened, and the patient died the day after the injury. After death urine was found in the peritoneal cavity.

1930. A bladder together with the prostate gland. The bladder has been ruptured transversely across the superior wall, close behind the summit, the peritoneum being torn for a corresponding extent.

The mucous membrane protrudes through the aperture, and is turned back so as to form the edge of the opening. The peritoneum around the rupture is partly covered with a layer of exudation. 783

The patient was a man, 28 years of age, who, after drinking freely of gin, ran hastily from the public house and struck his abdomen against a post. He fainted, and was brought to the hospital in great pain. A catheter withdrew a small quantity of clear urine. The urine subsequently withdrawn by catheter is noted to have been on one occasion bloody. It is not stated in the MS. Catalogue how long the man lived.

1931. A bladder with the prostate gland and the recto-vesical pouch of peritoneum. In the superior wall of the bladder, extending from the apex downwards for 5 cm. is a longitudinal rent involving all the coats and their peritoneal covering. The edges of the rent have been brought together with a continuous catgut suture, which has been loosened at the lower part, where the rupture in the wall of the bladder is evident. The bladder is closely contracted, its mucous membrane being thrown into very prominent rugæ. The peritoneum forming the recto-vesical pouch is thickly covered with a layer of inflammatory exudation.

From a man, aged 47, who was admitted into U. C. H., under the care of Mr. Heath, Nov. 25, 1878, at 11 A.M. At 9.30 P.M. on Nov. 23, after having drunk two pints of beer, he began joking with his companions, one of whom threw him violently on his back by putting his leg behind him and forcing him back with his elbow, which hit him "in the stomach." He suffered great pain, and was taken home at once. He had passed water freely half an hour before the accident. Before admission a catheter was repeatedly passed, and only a small quantity of bloody urine removed each time. Opium was freely given. On admission the patient was very ill and extremely anæmic; he lay on the left side with the knees drawn up, and suffered great abdominal pain. The abdomen was distended, excessively tender and dull from the pubes half way to the umbilicus; there was shifting dulness in flanks. A No. 7 catheter was passed (a stricture prevented the use of a larger instrument). and three ounces of bloody urine were drawn off in an intermittent stream. At 3 P.M. the patient was put under the influence of chloroform and an incision made in the middle line of the abdomen for two inches above the pubes. A gush of bloody urine immediately occurred, and a large quantity of coagulated blood was removed from the abdominal cavity. The wound in the bladder was then sewn up with a continuous catgut suture, the abdominal cavity washed out with warm water, and the wound closed, a large drainage-tube being passed through its lower part into the pelvic cavity. A catheter was tied in. After the operation the patient was considerably relieved. The urine was passed in good quantity and became gradually free from blood. The drainage-tube was removed from the wound after twenty-four hours, as it seemed to be doing no good. The patient lived till November 30. Violent vomiting set in on the last day. Blood reappeared in the urine, which contained large quantities of albumen.

At the *post mortem* examination the small intestines were much distended, and for two inches around the wound were adherent by recent exudation. Above and on each side of these adhesions there was no trace of peritonitis. The recto-vesical pouch contained about six ounces of black clotted blood, somewhat offensive in odour. The lower part of the rent in the bladder was gaping. All the other organs were healthy. (*See* Heath, Med. Chir. Trans. vol. lxii, p. 335.)

1932. A bladder together with the prostate gland. In the superior wall of the bladder is a nearly vertical rent, about 3 cm. in length, extending backwards from the apex. Around the edge of the aperture the mucous membrane is everted over the torn surface of the muscular wall. The bladder is contracted. 6099

From a man, aged 23, who was admitted into U. C. H. in 1885. On the night before admission, whilst hurrying to a urinal he ran against some iron railings; he could only pass a few drops of urine and, feeling faint, went home in a cab, vomiting two or three times on the way. At 12.15 A.M. on the following morning he passed a pint of bloody urine, and two hours later was admitted to the hospital. He was not collapsed, but complained of pain above the pubes and in the left flank; 3 or 4 ounces of almost pure blood were withdrawn by a catheter; the temperature was 99°·4 to 100°; a morphia suppository was given and belladonna fomentations applied to the abdomen. On the second day the temperature was 98° to 101°·5, the abdomen was resonant, except over a small area in the left iliac region; at 11 A.M. the patient became restless and the pulse feeble; blood-stained urine was several times withdrawn with a catheter. The abdominal pain and distension increased, vomiting set in, and death occurred on the third day after the injury. At the *post mortem* examination 14 to 15 ounces of blood were found in the pelvis and left iliac fossa, the intestines were injected, and those at the lower part of the abdomen were adherent by recent exudation. (Surg. Reg. Rep. 1885, p. 115.)

FOREIGN BODIES IN THE BLADDER.

Foreign bodies in the male bladder have usually been introduced by the patient himself in his attempt to relieve a real or imaginary stricture of the urethra (1933, 1934). Hysterical patients of either sex occasionally pass foreign bodies into the urethra, which may, if small enough, find their way back into the bladder. In No. 1935 a gum-elastic catheter was accidentally passed into the bladder, probably in an attempt to procure abortion. Bullets may enter the bladder at the part uncovered by peritoneum without causing death, and in such cases have been afterwards removed by operation. Sequestra may find their way into the bladder by ulceration (1943), and in No. 1944 the nucleus of a stone is a fœtal tibia, which passed into the bladder in a case of extra-uterine fœtation. All foreign bodies in the bladder become encrusted with phosphates, and thus a small body may become the nucleus of a large stone (1944).

1933. A piece of glass tube, 8 cm. in length and 7 mm. in diameter, which was removed from the bladder of a man. The ends have been smoothly rounded by grinding. 3514

The man, who was 56 years old, had had some difficulty in passing water for two years, and for the last nine months had been in the habit of passing this piece of glass tube, with a string attached to it, into the urethra every few days. On September 2, 1844, while using the tube, the string broke and the tube was left in the urethra. He was admitted next day, complaining of great pain over the bladder and in passing water; the former was increased on pressure on the lower part of the abdomen. Nothing could be felt with the sound, but next day it was made to click against the tube. On the same day, September 5, Mr. Quain performed the lateral operation, and the patient was discharged, cured, on October 8.

1934. The handle of a pen-holder, 8·5 cm. long, which was removed from the bladder of a man by cystotomy.

From a man, aged 42, who was admitted under Mr. Heath, into U. C. H. October 31, 1874. Twenty-four hours before admission he had passed the pen-holder down his urethra, believing himself to be suffering from a stricture. He lost hold of it, and sent for a medical man, who pushed it back into the bladder, and then sent him into the hospital. On sounding, the pen-holder was clearly felt. All attempts to move it with a lithotrite failed, and accordingly a median perineal incision was made into the bladder, by which the pen-holder was easily removed. On the following day there was slight hæmorrhage, necessitating plugging of the wound. On November 3 there was profuse diarrhœa. On November 5 he had a severe rigor; on Nov. 7 the right knee became swollen; on Nov. 9 the left elbow swelled and the left saphenous vein became plugged; on Nov. 11 a subcutaneous abscess formed on the right arm, and on Nov. 15 he died. The *post mortem* examination showed a sloughing wound coated with phosphates; cloudy swelling of the kidneys; all the other viscera healthy; pus in the affected joints, and scattered abscesses in the muscles of the thigh.

1935. A gum-elastic catheter, thickly coated with phosphates, which was removed from the bladder of a young woman. 5378

The patient, a woman aged 21, was admitted into U. C. H. December 15, 1870. For one month previously to admission she had suffered from incontinence of urine; the urine contained blood and pus. The coiled-up catheter was felt with a sound and was thought to be a large calculus. On December 21 the urethra was enlarged by incision and the catheter removed with forceps. The edges of the wound were brought together by two silver sutures. On Dec. 25 she was delivered of a fœtus of about the fourth month. She refused to give any account of the manner in which the instrument got into the bladder, and even professed ignorance of its being there. She had been in the service of a medical man, and it is supposed she stole one of his instruments, and introduced it with the intention of procuring abortion. The patient ultimately made a good recovery.

1936. A portion of a gum-elastic catheter, measuring 10 cm. in length, encrusted with a granular layer of phosphates, thickest at its ends. The catheter is bent in a semicircle, but at each end is turned at an angle with the main part. 3504

From a man, aged 70, who had suffered from retention of urine at intervals for several years, necessitating the use of a catheter. About three weeks before admission in October 1838, he came to U. C. H., complaining of great pain when making water, and a frequent desire to void it. On admission on October 30, "a stone was detected, though somewhat indistinctly;" but after another examination Mr. Liston was convinced of the presence of a stone, and accordingly performed the lateral operation on November 7. The man speedily recovered, and was discharged on November 30.

1937. Calculous fragments passed by the urethra after lithotrity; they are deposited on barley-corns, which the patient had some months before introduced into his urethra. 3473

"The patient, an old man above 70, confessed that, whilst employed in assisting the reapers during harvest, he had thoughtlessly passed the barleycorns into the urethra, one after another, holding them by their beards; until the symptoms became troublesome, he had forgotten the circumstance, thinking that they might have passed off with the urine, and, strange to say, he did not apply until months after the occurrence, when the crystalline deposit had become abundant, so as to cover the foreign matter completely." The operation was performed in 1828, and is stated to have been the first successful lithotrity in this country. (Liston's Practical Surgery, 4th edition, 1846, p. 489.)

1938. Several slender lanceolate calculi, the largest 23 mm. in length, which formed in the bladder upon pieces of fine thread from a frayed gum-elastic catheter. The threads can be seen projecting from the ends of some of the calculi. 6667

From the bladder of a man, aged 79, who died of carcinoma of the prostate. He had used a catheter for 18 months, and there was intense cystitis. (Surg. Reg. Rep. 1890, p. 86.)

1939. An elongated oval calculus, composed of ammonio-magnesium phosphate, measuring 32 mm. by 24 mm. It is of the colour of pipe-clay, rough on the surface, and has been formed upon a large pin, 3·5 cm. in length. The head of the pin forms the nucleus of the calculus, the calculous matter being deposited in concentric layers around it. 16 mm. of the pin project from the stone. This part was probably fixed in the wall of the bladder. 1941

From the bladder of a female.

1940. A large phosphatic calculus, measuring 5 cm. in diameter. It is almost pure white in colour, soft, and somewhat rough on the surface. The nucleus is composed of pieces of wax and the surrounding part of mixed phosphates. (See 1941.)

From Mr. Liston's first case of lithotomy.

1941. Small phosphatic calculi formed on pieces of straw, removed from "the sinus of the urethra" of the same patient as the preceding specimen.

"Four or five years ago, in the Edinburgh Hospital, I cut five or six stones, formed on pieces of straw, from the sinus of the urethra of an old man, from whose bladder I had extracted a large calculus at least ten years previously. He laboured under stricture when first under my care; this was relieved at the time he had lithotomy performed; but it appeared that subsequently difficulty in micturition arose. It is probable that in the dilated part behind the stricture a small concretion had been subsequently either detained or formed; to displace this and procure more free evacuation, he had recourse to the introduction of straws into the passage; and, in fact, I discovered him in the midst of one of his operations with this primitive sort of catheter at the gate of the hospital as he came to be admitted. On sawing open, a few weeks ago, the calculus originally extracted from the patient (the first I ever cut), the nucleus was discovered to be quite soft, and as large as a haricot bean. My friend and colleague, Mr. Graham, was so kind as to examine the mass, and found it to be impure bees' wax. This had, no doubt, at some period been introduced by the urethra. The mass of the calculus was phosphate of lime with very little phosphate of magnesia, so that it was not at all fusible. It must have been rapidly formed." (Liston's 'Practical Surgery,' 4th edition, 1846, p. 519.)

1942. Fifty-eight calculi, composed of ammonio-magnesium phosphate, some of which seem to be deposited on small pieces of flint. 1310

From a subject brought into the dissecting-room.

1943. A section of a calculus measuring 3·7 cm. × 3 cm. The nucleus is a thin scale of bone, about 14 mm. in extreme length, and of the usual irregular form of a sequestrum. The stone is composed of mixed phosphates, deposited in layers and of moderately dense structure.

The nucleus is probably a sequestrum from the pubic bone. It was from a case under the care of Mr. Liston.

1944. A pyriform calculus measuring 5·3 cm. × 2·5 cm., from the bladder of a female. The section shows it to be composed of two parts; the lower and wider part has a white close-textured nucleus, evidently composed of phosphates, surrounded by a porous imperfectly laminated mass of mixed phosphates. The upper elongated part of the stone is formed of mixed phosphates deposited around a fœtal tibia. The section shows only a part of the tibia, but enough to prove that its lower end would not nearly reach to the centre of the lower part of the calculus, which has probably been formed upon some other fœtal remains. The upper end of the tibia is but thinly covered. 3513

From a woman, aged 46, who applied to Dr. Ross Leitch of Leamington to have a stone extracted from her bladder. A stone was detected, but owing to the ill health of the woman the operation for its removal was not performed, and she died, exhausted by diarrhœa, soon afterwards. About three years before (March 1841), she gave a small black mass, about the size of a horse-bean, to a medical man, and said it had passed from the bladder. A short time before this she had suffered from pain in the loins.

At the *post mortem* examination a sac containing the remains of a fœtus was found in the right iliac fossa; this sac was connected, externally, to the iliacus muscle, and in it were the bones of the head of a fœtus, forming a mass about the size of a small orange. The ribs and bones of the extremities were below it. The bladder was much thickened and contracted, and in places ulcerated. In it was an oval calculus. The left femur of the fœtus projected against the side of the bladder, and had occasioned a small ulceration of the coats.

('London and Edinburgh Monthly Journal of Medical Science,' 1845, p. 198.)

DISEASES OF THE BLADDER.

MALFORMATIONS OF THE BLADDER.

(*See* CONGENITAL MALFORMATIONS.)

HYPERTROPHY AND DILATATION OF THE BLADDER.

Hypertrophy of the muscular coat is invariably met with when there has existed some obstruction at the neck of the bladder or in the urethra, which could be more or less perfectly overcome by increased force in the contraction of the bladder. It is occasionally found as a result of chronic catarrh of the bladder, in which the ropy mucus has required an increased force for its expulsion. The hypertrophy is chiefly shown by the increased thickness of the wall of the bladder. At the same time the wall loses its normal membranous appearance and assumes a fleshy look. The normal arrangement of the muscular tissue in bundles is maintained, but the bundles, are greatly increased in thickness, so as to form prominent ridges within the bladder. This condition is spoken of as "fasciculation" (1946). Between the ridges are hollows of various depths. The forcible contraction of an hypertrophied bladder on its fluid contents may lead to a gradual deepening of some of these hollows, until the mucous membrane and submucous tissue become thrust between the muscular bundles so as to form a projection on the outer surface of the bladder. When this occurs the pouch thus formed is called a "sacculus," and the bladder is said to be "sacculated." A hypertrophied bladder usually becomes contracted in consequence of the chronic inflammation accompanying most of the diseases giving rise to hypertrophy, and which renders the patient unable to bear the slightest distention of the diseased organ. In some cases, however, in which there has been little or no cystitis, the hypertrophied bladder is at the same time considerably dilated. In cases of great hypertrophy of the bladder the ureter, having to pass for a considerably increased distance through the muscular coat, is somewhat obstructed, and this aids in producing the dilatation of the ureter and pelvis of the kidney so often met with in diseases of the bladder (1947).

Pure *dilatation* of the bladder is met with in prolonged over-distention from paralysis, and in those cases of disease of the prostate in which, the obstruction being valvular, increased contractile power would rather hinder than favour the exit of the urine (1948). In these cases the wall is not thinned in proportion to the dilatation; in fact it may even be considerably thicker than natural, but it will be seen on examining the cut surface of the bladder, when laid open, that the thickening is due to the growth of dense opaque fibroid tissue and not to the development of new muscular fibres. In some cases of dilatation sacculi are formed by the protrusion of the mucous membrane outwards between the bundles of muscular fibres; but this condition is not so common as in hypertrophy.

1945. A urinary bladder, together with the prostate gland and part of the urethra. There is a stricture of the urethra (marked by a piece of whalebone) near the junction of its bulbous and membranous parts, and as a consequence of the obstruction, the muscular coat of the bladder has become greatly hypertrophied and measures about 8 mm. in thickness, although not fully contracted; the muscular fibre-cells are arranged in thick fasciculi, giving the section much the appearance of a voluntary muscle. The mucous membrane is minutely corrugated so as to appear almost warty; posteriorly it is raised in low transverse ridges by the hypertrophied fasciculi beneath. The mucous membrane is opaque, dense, and thickened from chronic inflammation. Both the ureters are dilated and hypertrophied; their vesical openings are marked by wrinkled depressions, and are connected by a broad crescentic hypertrophied ridge of muscle. The urethra behind the stricture is dilated and deeply pitted. 482

From a man aged 60, who had long suffered from stricture and retention of urine, which was relieved by instruments. Death occurred from peritonitis, the cause of which is not stated in the MS. Catalogue.

1946. Part of a hypertrophied bladder, the mucous membrane of which is raised in smoothly rounded prominent ridges by the hypertrophied bundles of its muscular coat, giving rise to the condition known as *fasciculation*. The ridges are arranged transversely and freely connected so as to leave oval pits and slit-like depressions between them. 199

1947. A piece of the wall of a greatly hypertrophied bladder with one of the ureters passing through it. The section has been carried in such a direction as to expose the ureter in its passage through the wall of the bladder. It lies between the hypertrophied bundles of muscular fibres for a distance of nearly 2 cm., and its course is somewhat less oblique than natural. The submucous tissue of the bladder is thickened and opaque. The orifice of the ureter is not contracted. Immediately above the muscular coat of the bladder the ureter is dilated to about the size of an external iliac artery.

1948. A bladder with the prostate gland. The prostate is hypertrophied, chiefly in the middle line, and forms a transversely oval swelling immediately behind the urethral aperture. As a result of the valve-like obstruction to the exit of urine, caused by the enlargement of the prostate, the bladder has become greatly dilated, but its walls are not proportionately thinned. The maintenance of their thickness is due chiefly to a growth of fibroid tissue on both sides of and in the muscular coat. The interior of the bladder is slightly fasciculated. The ureters are dilated and their orifices abnormally large, though they terminate with natural obliquity.

The mucous membrane of the bladder presents no marked sign of chronic inflammation. A piece of whalebone has been passed into a false passage which leads from the urethra in front of the enlarged prostate; the adjoining part of the floor of the urethra is superficially ulcerated. 808

SACCULI OF THE BLADDER.

Sacculi are formed by the protrusion of a pouch of mucous membrane between the bundles of the muscular coat, usually in association with hypertrophy of the latter. The sacculi are composed of mucous membrane and submucous tissue, often covered by peritoneum (1950); occasionally a thin layer of the muscular coat is stretched over the sacculus (1955). The wall of the sacculus may be thickened by a new formation of fibrous tissue (1951). Sacculi are situated most commonly in the part of the bladder a short distance above the level of the ureteral orifices (1949); they are frequently multiple (1953).

Among the important effects of sacculi of the bladder are the following:—(1) The sacculus may reach such a size as to form, when distended, a considerable tumour (1951). (2) A calculus may form in the sacculus and is then said to be encysted (1953). (3) In cases of cystitis the presence of sacculi, which cannot be washed out or emptied, renders the condition unusually intractable. The cystitis may cause ulceration of the mucous membrane of the sacculus, and thus the inflammation extend to the peritoneum or pelvic cellular tissue (1954). (4) In the operation of lithotrity the presence of a sacculus may interfere with the evacuation of the fragments of a crushed stone (1955). (5) The pressure of a sacculus on one of the ureters may lead to secondary changes in the kidney.

1949. A bladder and prostate gland. The middle lobe of the prostate is hypertrophied, and forms a small hemispherical swelling immediately behind the urethral aperture, which it must have completely overlapped. The walls of the bladder are slightly hypertrophied, and its interior, above the trigone, transversely fasciculated. Both the ureters are dilated and hypertrophied. Between the hypertrophied fasciculi, on the right side, the mucous and submucous coats have been protruded, and form a globular sacculus about 2 cm. in diameter; the constricted orifice of the protrusion is situated 13 mm. above and external to the orifice of the right ureter. The mucous membrane of the bladder is swollen and superficially ulcerated. 797

1950. A bladder, with the prostate gland and part of the penis. The part of the urethra preserved is widely dilated; its floor is ragged and marked by deep perforations, made apparently by the point of an instrument; the dilatation has probably resulted from a stricture in the bulbous portion of the urethra. The muscular coat of the bladder is greatly hypertrophied, measuring nearly 1 cm. in thickness. The mucous membrane is thickened and opaque. From the middle line of the superior surface of the bladder, 2·5 cm. above the trigone, a sacculus projects beneath the peritoneum; it measures 4·5 cm. in diameter, and communicates with the bladder by an oval opening measuring 8 mm. in its longer transverse diameter; the wall of the sacculus is composed of thickened mucous membrane and submucous tissue, covered by peritoneum. From a point 13 mm. above the left ureteral orifice another very small sacculus, surrounded by condensed areolar tissue, projects from the bladder. The ureters are dilated and thickened.

1951. A bladder and prostate, together with a large sacculus which nearly equals in size the bladder itself. The bladder is moderately dilated, but not hypertrophied. The greater part of the right half of the antero-inferior surface is abnormally thin, owing to a deficiency in the muscular fibres. The mucous membrane of the bladder is normal, except over the area above mentioned, where it is very thin and not wrinkled. The left ureter is normal, the right is dilated. The prostate is not enlarged.

The sacculus arises from the bladder by a rounded opening measuring 17 mm. in diameter, the inner edge of which is 17 mm. external to the left ureteral orifice. The wall of the sacculus is composed of slightly thickened mucous membrane and condensed fibrous tissue; it has no peritoneal covering.

It is probable that in this specimen the sacculus has resulted from the yielding of part of the bladder-wall weakened by atrophy of the muscular coat.

There is no history to the specimen.

1952. A bladder, with the prostate gland, adjoining part of the urethra, and a portion of the skin of the perineum. In the posterior part of the bladder, above the openings of the ureters, are two symmetrical apertures, the mouths of two sacculi. The aperture above the left ureter is oval and measures 2 cm. in its longer diameter; it is the mouth of a sacculus which nearly equals the bladder in size, and is lined with normal mucous membrane; the upper part of the sacculus is covered with peritoneum; the vas deferens is stretched over its left surface; the ureter is compressed between the lower part of the sacculus and the bladder. The opening in the bladder above the right ureter is rather smaller than the other and leads into a sacculus not larger than a walnut, which projects externally in the sulcus between the bladder and the right half of the larger sacculus; on the surface of this smaller sacculus is seen the right vas, and in front of it the right ureter, which is dilated.

There is a stricture in the bulbous portion of the urethra, and an irregular perineal abscess communicates with the membranous portion of the urethra and has been opened by an incision in the perineum. 1063

1953. A bladder and prostate gland laid open from the front. The bladder is greatly dilated, and its walls thinned. The prostate is not enlarged. Several sacculi project from the bladder; the largest, which is distended with cotton-wool, lies at the apex, and is about the size of a pigeon's egg; the smallest is not much larger than a pea; the sacculi are composed of healthy mucous membrane. Three of them are filled by smooth round calculi.

From a dissecting-room subject.

1954. A bladder, together with the prostate gland. The muscular coat of the bladder is considerably hypertrophied and its interior fasciculated; the ureters are tortuous and dilated; the prostate is considerably enlarged. On the inner surface of the bladder are five minute apertures between the fasciculi of hypertrophied muscle; these openings lead into abscess-cavities which, with the exception of the one above the orifice of the right ureter, are situated beneath the peritoneal covering of the superior surface of the bladder. Three of the openings are arranged in a series a short distance above the ureteral orifices; the other two are situated near the summit of the bladder. The largest abscess cavity, which is situated in the middle line, measures 4 cm. in diameter.

Each of the abscess cavities has been freely laid open to display the sloughy condition of the inner surface. The surrounding peritoneum is partly covered by a thin layer of inflammatory exudation. 1634

It is probable that cystitis was present, and that the extension of the inflammation through the mucous membrane of small sacculi caused the abscesses on the external aspect of the bladder.

1955. A bladder and prostate gland, the former presenting a large sacculus. The bladder is contracted and the mucous membrane is thickened and irregular as the result of chronic cystitis. The prostate is greatly enlarged, the middle lobe projecting prominently into the bladder. The mouth of the sacculus is situated on the inner side of the orifice of the left ureter and measures 1 cm. in diameter. The sacculus has an external diameter of 5 cm. and contains numerous fragments of a crushed uric acid calculus. The wall of the sacculus is thick, and some of the muscular tissue of the bladder-wall is continued into it. The left vesicula seminalis and vas lie on the surface of the sacculus, and the right vas along its right border. The ureters are not dilated. 6633 A

From a man, aged 75, who was under the care of Mr. H. T. Herring. He had been sounded 10 years previously with negative result. In January 1891 a stone was detected, and on February 13 lithotrity was performed. The operation was followed by very severe spasmodic pain in the bladder, and death occurred suddenly from collapse on the 10th day. One kidney contained a single large cyst and the other scattered small ones.

CYSTITIS.

Inflammation of the bladder is usually the result of a bacterial infection, and is most commonly due in its severe forms to the direct introduction of septic matter into the bladder during the passage of catheters and other instruments. It is a very common complication of all forms of bladder disease, and may occur in an acute or chronic form. The bacterial infection frequently causes ammoniacal decomposition of the urea, and the presence of urine undergoing this change in the bladder greatly increases the intensity of the inflammation. Cystitis is particularly liable to occur in any case in which there is an obstruction to the proper outflow of urine, and thus, especially in its chronic form, it is an almost invariable complication of such diseases as urethral stricture, prostatic enlargement, and vesical calculus.

In *Acute cystitis* the mucous membrane is swollen and reddened. The colour is most marked on the prominent parts of the rugæ, where it assumes a dark purple tint. In very intense inflammation there may be hæmorrhage into the mucous membrane. When the inflammation is accompanied by decomposition of the urine, it is not uncommon to find the bladder lined with a dense membranous exudation resembling the false membrane of diphtheria. On the surface of the membrane there is in most cases a deposit of amorphous phosphates. In extreme cases the mucous membrane sloughs and forms a shreddy mass, mixed with mucus, pus, and phosphates. If this be removed the muscular fibres are laid bare (1956). The sloughing may occur in localised areas, leaving irregular ulcers when the sloughs separate. Perforation of the bladder may occur in these circumstances. Occasionally suppuration takes place in the submucous tissue; the pus may be diffused or may form small abscesses beneath the mucous membrane. In acute cystitis, especially in females, large membranous masses are occasionally passed *per urethram*, composed of the layers of exudation above mentioned or of the separated mucous membrane (1958, 1959).

Chronic cystitis is characterised by thickening and induration of the mucous membrane with dark grey pigmentation, resulting from repeated attacks of intense congestion (1961). Here and there, especially on the prominent parts of the rugæ, there are patches of red. Ulceration is rare. It is very common to find the signs of chronic cystitis more or less concealed by redness and swelling, dependent on an acute attack just before death. In museum-preparations the red colour is usually lost; but the dark grey pigmentation is more or less recognisable. Chronic cystitis, especially when associated with decomposition of the urine, is frequently accompanied by a profuse discharge of ropy, tenacious mucus, sometimes mixed with a deposit of ammonio-magnesium phosphate and phosphate of calcium.

1956. The posterior half of a bladder, with the contiguous part of the rectum. The mucous membrane and nearly the whole of the muscular coat have been destroyed by ulceration of the bladder, the ureters, as they traverse the wall of the bladder, lying bare as if dissected. The interior of the bladder is everywhere uneven, softened, and shreddy. The bladder is considerably distended, probably as the result of paralysis, since there is no mechanical obstruction to the exit of urine displayed in the specimen. The recto-vesical pouch of peritoneum is obliterated by adhesions. 790

From a man who died 4 weeks after fracture of the spine.

1957. An elongated piece of mucous membrane, measuring 20 cm. in length, which was naturally discharged from the bladder of a female. It is perforated with large round and oval apertures which give to the whole a fenestrated appearance. 2063

1958. A cast, composed of mucous membrane and submucous tissue, with portions of the muscular coat, from a urinary bladder. 5318

The cast was passed *per urethram* by a woman 6 weeks after delivery. The labour was difficult and instrumental; the perineum was torn. There was no vesico-vaginal fistula.

The patient subsequently came under the care of Dr. Graily Hewitt for incontinence of urine. From this she recovered.

1959. A cast, composed of mucous membrane and submucous tissue with portions of the muscular coat, from a bladder. The surface of the mucous membrane is coated with phosphates. 5920

From a woman, aged 24, who was admitted into U. C. H. on May 26, 1883, 3 weeks after parturition. Craniotomy had been performed on account of contracted pelvis resulting from old tuberculous disease. On admission there was intense cystitis, the urine being alkaline and containing pus, blood, and phosphates. The bladder was washed out daily with a solution of sulphate of quinine. On May 31 a mass was seen protruding from the urethra, and the membranous cast preserved in the specimen was easily withdrawn. The condition of the urine improved, but there was still a considerable degree of incontinence of urine when the patient left the hospital on July 24. (Dr. Graily Hewitt and Dr. Williams's *Case-books*, 1883, vol. ii, p. 419.)

1960. The bladder of a boy. The mucous membrane is quite opaque. The bladder is lined with a thick layer of structureless semigelatinous substance, probably coagulated mucus, in places enclosing opaque white grains of phosphate of calcium. The muscular coat is slightly hypertrophied. 4073

From a boy, aged 8, who had long suffered from much pain in the hypogastrium, and was in the habit of passing gelatinous matter by the urethra. The disease appears to have been chronic catarrh; but its pathology is obscure.

1961. A male bladder the seat of chronic cystitis, opened in front. It is moderately dilated. The muscular coat at the lower part of the bladder is of nearly normal thickness, but contains an excess of fibrous tissue; traced upwards it becomes gradually thinner, until, at the summit, it appears to be almost entirely wanting, so that the bladder-wall is quite translucent. The inner surface of the bladder, especially above the trigone, is markedly fasciculated, the deeper fasciculi running transversely and the more superficial ones in a curved direction upwards towards the summit. There is a small deep pouch behind the trigone. In the upper part of the bladder the mucous membrane is smooth, thin and pale; in the lower part it is rough, indurated, and so deeply pigmented as to be greyish-black in colour. The ureteral orifices are normal and the ureters not dilated. There is moderate uniform enlargement of the prostate, which does not, however, project into the bladder. Several of the prostatic veins are thrombosed. 9104

From a man, aged 73, who was admitted into the Lewisham Infirmary Nov. 14, 1902, under the care of Dr. F. S. Toogood, with retention of urine. Eighty-six ounces of urine were drawn off. Death occurred on Nov. 26. There was double pyelo-nephritis.

1962. The kidneys and bladder of a female, who died of cystitis and suppression of urine. The kidneys, except for some irregularity in the shape of the right, are normal. The right ureter is double in its whole length, the two parts being connected at their lower extremity but opening separately into the bladder. The mucous membrane of the bladder is slightly discoloured and its rugæ swollen. Above the orifice of the right ureter is a small sacculus within and around which for a distance of 1 cm. the mucous membrane is covered with a thick adherent membranous deposit. There is a similar but much smaller patch of membranous deposit external to the orifice of the left ureter. 7940

From a woman, aged 38, who was admitted into U. C. H., under the care of Dr. Roberts Dec. 19, 1897, in the 5th month of pregnancy. She had borne one living child and had had one miscarriage; she had typhoid fever 5 years previously, and subsequently had passed a gallstone. During the fortnight before admission the patient had suffered from abdominal pain, and for a week from vomiting and diarrhœa. When admitted in the evening of Dec. 19, the patient was cold and collapsed and vomiting frequently; there was œdema of the trunk; no urine had been passed since the preceding day, and the bladder was empty. On Dec. 20 vomiting still continued; the temperature varied from 96°·8 to 97°·8; seven drachms of offensive urine, containing pus, with one-sixth albumen, were withdrawn by the catheter. On Dec. 21, 8½ ounces of urine were secreted; temperature 96°·4 to 97°; pulse 88 to 104; there was an erythematous eruption on the left upper extremity; the patient vomited once. On Dec. 22 the rash had spread to the face and trunk; the patient was more drowsy; about 8 ounces of neutral urine, less offensive than before, were drawn off. On Dec. 23 at 3 P.M. the patient aborted and died quietly at 10.50 P.M. No urine had been secreted during the day. At the *post mortem* examination no important changes were found in the other organs. The microscopic appearances of the kidneys were normal. (Dr. Roberts's *Case-books*, 1897, Females, p. 7.)

TUBERCULOUS DISEASE OF THE BLADDER.

Tuberculous disease of the bladder occurs most commonly as a late complication of tuberculous affections of other parts of the genito-urinary tract, such as the prostate and testicle (1963); the disease may, however, be primary. By the breaking down of tuberculous nodules in the mucous membrane, small shallow circular ulcers result and by their coalescence may gradually lead to extensive loss of substance. When the disease is secondary to an affection of the prostate, the trigone is first involved and irregular, yellow caseous nodules may be seen projecting beneath the mucous membrane.

1963. A bladder, together with the prostate, vesiculæ seminales, and parts of the vasa deferentia, affected by tuberculous disease. In the mucous membrane of the bladder are large numbers of circular ulcers, the largest of which measure 5 mm. in diameter; the ulcers are superficial and have cleanly-cut edges. In several of the ulcers a thin layer of cheesy substance still covers the floor. Among the ulcers are several small yellow nodules over which the mucous membrane is still intact. One ulcer is situated immediately below the orifice of the right ureter, and there is also superficial ulceration of the mucous membrane at the neck of the bladder. The prostate is enlarged, and the section shows that both lobes are infiltrated with dense caseous material. The right vesicula seminalis is enlarged by caseous deposits, and similar caseous material fills the corresponding vas, which in its lower part is considerably distended. The left vesicula seminalis appears to be healthy, but at its termination the vas is somewhat enlarged. 7645

From a patient who died of general tuberculosis. (*See also* No. 1917.)

SIMPLE TUMOURS OF THE BLADDER.

Papilloma. This, which is usually known as the "villous tumour," is the only common simple tumour of the bladder. It consists of delicate vascular processes, often of considerable length, and covered with epithelium similar to that of the bladder. A villous tumour is sometimes single; it is then usually pedunculated and is attached most commonly near one of the ureteral orifices (1964). More frequently the tumours are multiple and are then usually sessile (1968). The structure of the tumours readily explains their liability to cause profuse hæmaturia and the possibility of the escape of detached villous processes in the urine. A villous tumour growing near one of the ureteral orifices may occasion dilatation of the corresponding ureter and kidney (1968), or the growth by causing obstruction to the outflow of urine may cause hypertrophy of the bladder and consecutive changes in both kidneys (1965).

Myxoma. The polypoid tumours occasionally formed in the bladder in children are usually composed chiefly of myxomatous tissue (1979). Such tumours are closely allied to the sarcomata.

1964. A bladder, laid open from behind, together with the anterior part of the pelvis and a portion of the skin above the pubes. In the bladder is a villous tumour, 3·5 cm. in diameter, and composed of long slender papillary processes. The tumour is attached by a stout pedicle, 12 mm. in length, to the mucous membrane slightly external to the orifice of the right ureter, the pedicle enlarging somewhat at its attachment to the bladder. In the anterior wall of the bladder is an opening which communicates with the exterior through the portion of skin preserved in the specimen, and has resulted from the operation of tapping the bladder. The muscular wall of the bladder is hypertrophied; the mucous coat is thickened and opaque from chronic inflammation and, around the opening of the fistula, almost warty in appearance. The ureters are dilated.

From a man, aged 38, who came under the care of Sir Henry Thompson for hæmaturia. In April 1877 some small portions of solid matter which were passed in the urine were proved microscopically to be portions of a villous tumour. He continued his business all the summer, although often hindered by severe pain and hæmorrhage. Towards the end of 1877 his sufferings, his frequent micturition, and inability to pass urine without a catheter, which he often required every two hours, confined him to his room; and he took very large doses of morphia by subcutaneous injection, to render life endurable. He was evidently drawing near his end, and catheterisation became increasingly painful, so that on Jan. 7, 1878, Sir Henry Thompson opened the bladder above the pubes and introduced a small tube. This afforded considerable relief, and rendered the catheter unnecessary. He died on Jan. 31.

It was from the consideration of this case that Sir Henry Thompson was led to introduce the practice of digital exploration of the bladder through an incision into the membranous urethra. (Thompson, Tumours of the Bladder, 1884, p. 10.)

1965. A bladder and part of the penis, together with the right kidney and ureter. A villous tumour is attached by a short stout pedicle to the mucous membrane, slightly external to the orifice of the left ureter. The neck of the bladder and the adjoining part of the prostatic urethra have been dilated by the tumour. The muscular coat of the bladder is hypertrophied; the mucous membrane is normal. The right ureter is dilated and tortuous; the part of the left ureter preserved is also dilated. The pelvis and calices of the right kidney are dilated, and the pyramids absorbed; the cortex is thin and indurated, and the surface of the kidney irregular. 4131

From a man, aged 34, who suffered greatly from hæmaturia.

1966. A bladder within which a large villous tumour has grown. The bladder is greatly hypertrophied, its muscular coat measuring 1 cm. in thickness, and its inner surface being markedly fasciculated and the mucous membrane thickened. The lower part of the bladder is occupied by a large villous tumour attached by a rounded pedicle, which is traversed by the terminal part of the right ureter. From the wall of the bladder immediately above it there is a very small second growth concealed by the larger mass. Both ureters are considerably dilated: the wall of the right is much more thickened than that of the left.

From a man, aged 38, who was under the care of Mr. Berkeley Hill in U. C. H. His urine had been uniformly mixed with blood and passed by frequent dribbling, during exercise, for eight months. The morning urine was always free from blood. The symptoms suddenly disappeared for 3 or 4 days about one month before admission, but returned again after some heavy work. During the week before admission, the frequency increased to several times an hour; there was pain afterwards for 3 or 4 minutes at the end of the penis; the urine was generally bright red, twice almost black and containing clots; there was slight suprapubic tenderness. The base of the bladder was abnormally firm, but regular and not tender. Ergotine was injected subcutaneously, and the bladder was washed out. Long processes, covered with epithelium, came out in the eye of the catheter. The patient was restless on the third night after admission, and had two slight attacks of dyspnœa. On the following day he died suddenly whilst talking.

Both kidneys were dilated and presented areas of suppuration in the cortex; there was no pyelitis. The villous tumour in the fresh state had a deep red tint.

1967. A bladder, with the prostate gland, ureters, and kidneys. The bladder has been laid open from the front to display numerous small, tufted, villous growths scattered over its mucous membrane. The largest of them, probably formed by several smaller, forms a lobular branching mass of closely packed delicate processes, and completely fills the neck of the bladder and overlies the urethral orifice. The bladder is hypertrophied and fasciculated. Both the ureters are uniformly dilated, but their walls are not diminished in thickness. The kidneys, especially the right, are shrunken and dilated, and the fatty capsule indurated and adherent.

1968. A bladder and prostate gland, with the ureters and kidneys. The bladder has been laid open through its anterior wall to display a widespread flattened villous tumour, which has grown from the mucous membrane of the neck and adjoining part. A few small isolated growths of a similar kind are scattered over the mucous membrane in the vicinity. The bladder is slightly hypertrophied, and both ureters are dilated, the right considerably, the left very slightly. The right kidney is greatly diminished in size, and shows the extreme effects of partial obstruction at the vesical orifice of the ureter unaccompanied by pyelitis. The pelvis is dilated. The pyramids are completely absorbed, and the resulting spaces lined with a smooth opaque mucous membrane, continuous with that of the pelvis. The cortex is greatly reduced in thickness, and the whole organ is shrunken. The left kidney shows the earliest result of partial obstruction to the outflow of urine. Its calyces are of about the normal size, and its papillæ pointed; the cortex is swollen and thicker than natural, as a consequence of some degree of overgrowth of the interstitial tissue.

The section of the cortex of the right kidney shows crowding of the Malphigian bodies, and almost complete destruction of the cells of the renal tubules, without any marked increase of fibrous tissue.

From a man, aged 60, who had enjoyed good health until eleven years before death, when he first noticed some blood in the urine, after exertion. This recurred at intervals. Subsequently he had severe pain in the loins and frequent micturition, the urine being very bloody at the end of the act. Death occurred in a state of extreme emaciation.

1969. A bladder and prostate laid open from the front to display three villous tumours. The largest tumour forms an irregular elongated mass 10·5 cm. in length lying obliquely above the orifice of the left ureter, and having a base of attachment 5 cm. in length and 2·5 cm. in breadth. The surface of this tumour is irregularly papillary and the outer extremity, which is much the most prominent, is stained by hæmorrhage. The other tumours are small and situated on the right side of the bladder at a distance of 3·5 cm. one from the other; they are pedunculated and delicately papillary. The bladder is thin and moderately dilated, and on the right side below the two smaller tumours is a small sacculus. The ureters are not dilated. 8985

Microscopic Structure.—The tumour consists of an irregular mass of very vascular papillæ, between the deepest parts of which the epithelium has accumulated in large masses. The submucous tissue and underlying muscle are infiltrated with lymphocytes.

From a man, aged 67, who was admitted into U. C. H., under the care of Dr. Roberts, April 16, 1902. Sixteen years previously he had been laid up for 4 months with pain in the back; 4 years before admission he passed a stone *per urethram* and suffered from hæmaturia for a short time. Occasional attacks of hæmaturia followed, becoming more profuse and attended with painful and frequent micturition. On April 19 the bladder was sounded, with negative result, but with the endoscope a dark red patch was seen at the neck of the bladder and was thought to be a growth. By combined rectal and abdominal examination it was thought that an indefinite tumour could be felt above the prostate. Profuse hæmaturia continued, and the patient died of intense anæmia on May 27. (Dr. Roberts's *Case-books*, 1902, Males, Cheeney.)

1970. Three large fragments of a villous tumour with several smaller pieces removed from the bladder. The surface of the growth is whitened with a thick crust of phosphates.

From a man, aged 29, who was first seen by Sir Henry Thompson on July 26, 1880. Eight years before, he had passed a piece of gravel the size of a pea. For three years he was quite well. Then micturition became frequent, with pain at the end of the penis after the act, and occasionally blood was passed, especially after exercise. He was sounded and a small calculus found. On August 5 a small oxalate of calcium stone was crushed and removed. The improvement was very slight; he could not quite empty his bladder, and had to use a catheter daily. The lithotrite failed to find anything in the bladder. He resumed his employment, but the symptoms gradually increased. On October 8 Sir Henry Thompson removed a quantity of phosphatic matter with a lithotrite. He then seized what at first felt like a calculus and partially crushed it under pressure, but it was fixed and gave the impression of being a portion of an encysted calculus. More phosphatic matter was washed out, and the effect watched. As no benefit resulted, digital exploration of the bladder was performed on Nov. 6, 1880, through an incision into the membranous urethra, and a tumour about the size of a chestnut was felt, growing apparently from the fundus and somewhat to the left side. It was coated with phosphatic matter. Sir Henry Thompson then twisted off the mass with a pair of small forceps, the chief part coming first, followed by some smaller pieces. There was very little bleeding, and the recovery was rapid and complete. Fifteen months later he was in perfect health.

This was the first case in which Sir Henry Thompson diagnosed the presence of a villous tumour by digital exploration of the bladder. (Thompson, Tumours of the Bladder, 1884, p. 12, & Med.-Chir. Trans. vol. lxv, p. 147.)

1971. A small villous tumour of the bladder removed by operation. The point of attachment is hidden among the delicate papillæ of which the tumour is composed.

1972. Two separate portions of a villous tumour of the bladder, removed by operation. The growth is cauliflower-like in appearance.

From a man, aged 42, who had for 8 years suffered from attacks of hæmaturia, and more recently from increased frequency of micturition. Fragments of the growth were found in the urine. On Nov. 16, 1883, the tumour, excepting the rather wide base, was removed by Sir Henry Thompson, through an incision into the membranous urethra. In May 1884 the patient's only symptom was slight hæmaturia after any unusual exercise. (Thompson, Tumours of the Bladder, 1884, p. 108.)

1973. Several portions of a papillomatous tumour of the bladder, removed by operation. (See No. 1974.)

1974. The bladder from which the tumour preserved in the last specimen had been removed 2 years previously. There is no evidence of recurrence.

From a man, aged 63, who had suffered from hæmaturia after exercise for 15 months. Fragments of the growth were removed from the bladder by the aspirator, nothing having been found in the urinary deposit by simply washing out. The tumour was removed by Sir Henry Thompson on May 30, 1884, through an incision in the membranous urethra. The patient was killed by an accident 2 years later. (Thompson, Tumours of the Bladder, 1884, p. 110.)

1975. Numerous fragments of a villous tumour removed by operation from the female bladder. (See No. 1976.)

1976. A small papillomatous tumour removed by operation from the same case as the preceding specimen. Along one border of the tumour is a narrow strip of the mucous membrane, to which it is attached. (See No. 1977.)

1977. Numerous fragments of a villous tumour removed from the same case as the two preceding specimens. 6101

From a woman who, at the age of 24, experienced painful and frequent micturition after a difficult confinement in January 1876. In August 1877 there was free hæmaturia for a week, and the bleeding recurred repeatedly during the next 2 years. Early in 1879 a severe attack of cystitis occurred, which became chronic. On May 9, 1882, Sir Henry Thompson dilated the urethra, under ether, and with the finger detected a villous tumour growing from the base of the bladder; the projecting parts of the growth were removed with forceps (No. 1975). In February 1883 a second operation was performed and another small papilloma removed (No. 1976). On February 20, 1885, a third operation was performed and numerous fragments of villous growth removed (No. 1977). (Thompson, Tumours of the Bladder, 1884, p. 98.)

1978. Three portions of a very delicate papillomatous tumour removed by operation from the bladder. (See No. 1979.)

1979. Numerous fragments of a large papillomatous tumour of the bladder, removed by operation from the same case as the preceding specimen. In some of the masses the papillary processes are large and irregular; in other parts they are small and closely packed. 6322

Microscopic Structure.—The tumour is a papilloma. The papillæ are covered with several layers of epithelial cells, the deepest of which are very elongated.

J. H. B., a man aged 40, had suffered for 3 years from intermittent hæmaturia, which gradually became more profuse. On July 7, 1883, Sir Henry Thompson removed a papillomatous tumour (No. 1978) through an incision in the membranous urethra (Thompson, 'Tumours of the Bladder,' 1884, p. 106, No. 15). In April 1884 the patient was in good health, but still had occasional hæmaturia. On September 30, 1887, he was admitted into U. C. H. under the care of Mr. Heath, the patient being very anæmic and the hæmaturia profuse. On October 12 suprapubic cystotomy was performed and a large growth (No. 1979) attached to the upper part of the bladder removed piecemeal with crushing forceps. Death occurred 70 hours after the operation. Two small papillomatous growths still remained in the bladder. Both kidneys were dilated, and there were areas of suppuration in the left. (Surg. Reg. Rep. 1887, p. 69, No. 1418.)

1980. The pelvic viscera of a female infant together with the kidneys and parts of the pelvic bones. The bladder and urethra have been laid open in front and the pubic bones separated. The interior of the bladder is nearly filled by a tumour which springs from the lower part on the right of the middle line. The tumour, which is at its attachment somewhat pedunculated, has an ovoidal shape and measures nearly 5 cm. in length; it is deeply divided into numerous lobules, which present a wrinkled surface as if from shrinking, and in section a soft somewhat spongy substance. From the lower aspect of the attached end of the tumour a separate lobule, 3 cm. in length, occupies the distended neck of the bladder and urethra, and in the natural condition of the parts would have presented at the vulva; this lobule is firmer than those composing the main mass of the tumour and presents a roughened, discoloured surface. The mucous membrane in the lower part of the bladder, especially around the attachment of the tumour, is considerably thickened. The bladder wall is not hypertrophied, but the ureters and both kidneys, especially the right, are dilated.

Microscopic Structure.—A section of one of the lobules of the tumour presents in its central parts a delicate open connective-tissue mesh-work, the spaces of which are incompletely filled with small round cells. In the more superficial parts the tissue is myxomatous, consisting of small branched cells forming a delicate reticulum. There is a complete epithelial covering, the superficial layers of which are horny.

From a female infant, 1½ years of age, who was under the care of Mr. Marshall. Death occurred from exhaustion before any treatment was attempted.

Malignant Tumours of the Bladder.

Carcinoma is the most common tumour of the bladder, and is always of the squamous cell variety. It may occur as a deeply ulcerated growth invading the wall of the bladder (1981) or may form a large rounded mass occupying the cavity of the bladder (1983) and occasionally the tumour presents a villous surface (1982). The bladder is usually hypertrophied and contracted, and in the later stages the disease is apt to be complicated by cystitis and secondary infection of the kidneys. From the bladder the growth may extend to the surrounding parts, and secondary deposits may form in the lymphatic glands and occasionally in internal organs.

The bladder may be invaded by the direct extension into its wall of a growth beginning in the rectum (1782), prostate, or uterus.

Sarcoma of the bladder is much less frequent than carcinoma, and is met with most commonly in childhood or after middle age. In children sarcomata of the bladder usually assume a polypoid form and may completely fill the cavity and distend the neck; they may be largely myxomatous in structure and sometimes contain transversely striated cells like muscle-fibres. Sarcoma may also invade the bladder of a child by extension from the prostate or vagina. A primary sarcoma of the bladder of the adult usually forms a lobulated tumour covered with mucous membrane, or, beginning in the cellular tissue outside the muscular coat, it may rapidly invade the surrounding parts.

1981. A bladder and prostate, the former having been laid open in front in order to display a carcinoma which involves the whole of its right side as low as the orifice of the ureter, and at the upper part extends to the left of the middle line. The surface of the growth has been rendered very irregular by ulceration, but, especially near the lower border, is papillomatous; the central part is somewhat deeply excavated; the edges are everted.

The muscular coat of the bladder is slightly hypertrophied, and the mucous membrane, in parts not involved by the growth, is thickened. The ureters are dilated. 5274

Microscopic Structure.—The growth is a squamous carcinoma. The cell-nests are large and numerous and present in the centre swollen epithelial cells.

From a man, aged 62, who came under the care of Sir Henry Thompson on March 28, 1866. In 1845, after an attack of typhoid fever, he had suffered for a short time from hæmaturia. In 1857 the hæmaturia recurred; frequent attacks of bleeding continued, and subsequently micturition became frequent and painful. In 1865 one or two attacks of retention of urine occurred. In March 1866 micturition was very frequent during day and night, and there was pain during the act above the pubes and in the back; blood appeared in the urine after the slightest exercise. The urine was acid and contained a little pus. Rectal examination was normal. The bladder was sounded with negative results. The treatment consisted in the administration of gallic acid, the use of morphine suppositories, and the daily injection of the bladder with a solution of nitrate of silver gradually increased from ¼ grain to 1 grain to the ounce. Great relief followed, and early in April the patient could walk 2 or 3 miles without hæmaturia. On April 29 severe cystitis occurred after exposure to cold; a catheter was tied in the bladder, but the cystitis increased and death occurred on May 28. The right kidney was studded with small growths similar to that in the bladder; there were no deposits in the lymphatic glands. (Trans. Path. Soc. vol. xviii, 1867, p. 162.)

1982. A bladder, opened in front in order to display a large carcinomatous growth, which involves the right half and at the upper part extends to the left of the middle line; the lower border of the growth reaches to the orifice of the right ureter. The surface of the tumour is extremely ragged and presents very irregular, ulcerated papillary projections; the edge is everted. The section which passes through the growth shows that the muscular coat has been destroyed, and at the upper part of the right lateral wall of the bladder below the reflection of the peritoneum the growth has completely perforated the bladder-wall, the neighbouring part of the peritoneum being covered with a layer of inflammatory exudation. In those parts of the bladder not involved by the growth the mucous membrane shows well-marked signs of chronic cystitis, being, in the upper part, thickened and irregularly rugose, and in the lower part superficially ulcerated. The ureters are moderately dilated, the right being larger and thinner than the left.

Microscopic Structure.—The tumour is a squamous carcinoma, with very large cell-nests.

From a man, aged 78, who was admitted into U. C. H. on March 30, 1880, under the care of Mr. Godlee. He was wasted to a skeleton. He had had difficulty in passing water for some time, and for several weeks it had dribbled away. The prostate was not markedly enlarged; but a hard ill-defined swelling was noticed in the right side of the abdomen, above Poupart's ligament. An English gum-elastic catheter, after a little difficulty in the penis, passed readily along a rough track for a long distance, drawing off a yellow offensive fluid. A quinine solution injected did not return. The patient died next day.

The perforation in the bladder opened into a ragged cavity, full of offensive pus, in the cellular tissue of the pelvis, around which there had been considerable inflammation. This formed the tumour felt above Poupart's ligament, and it was into this cavity that the catheter had passed. There was some peritonitis around it. There was also an old false passage in the penis. There was no septic pyelitis. There were no secondary growths in the lymphatic glands, but in the lower part of the left lung was a patch resembling pneumonia in appearance, composed of minute whitish masses of new growth, which were breaking down at the lower part into what had the appearance of suppurating cavities. Microscopic examination showed a beautiful epithelial structure, taking almost identically the appearance of the deeper layers of the skin, but in parts containing large globes, or irregular masses of horny epithelium similar to that found in the bladder. Patches of this structure were scattered through the pneumonic part of the lung. (Trans. Path. Soc. vol. xxxii, 1881, p. 30.)

1983. A male bladder laid open in front and divided through the attachment of a large globular tumour which occupies its interior. The tumour forms a solid fleshy mass about 7 cm. in diameter; its surface is irregular and sloughy, and the area of attachment of the tumour to the posterior bladder-wall, which extends downwards to the orifice of the left ureter, has a diameter of 3·5 cm., so that the whole mass is somewhat pedunculated. The growth in the area of attachment extends into the bladder-wall so as to destroy the muscular coat. The bladder is slightly hypertrophied, and the part of the right ureter preserved in the specimen is dilated. 4735

Microscopic Structure.—The tumour is a carcinoma. The cells are arranged in large masses, with a very scanty stroma; they are spheroidal or tailed in shape. There are no cell-nests.

There is no history to the specimen.

1984. A male bladder together with part of the urethra laid open anteriorly in order to display a large vesical tumour. The growth forms an irregularly globular mass, 7 cm. in diameter, attached to the wall of the bladder around the orifice of the right ureter by a base 13 cm. in circumference. The surface of the tumour is irregularly nodular and the orifice of the right ureter, which is situated upon it, is marked by a piece of glass rod. In its lower part the tumour overhangs its base of attachment, so as to occupy the neck of the bladder; the upper border of the tumour is shelving, and here the surface is coarsely warty. A smooth nodular projection of the growth extends through the substance of the bladder-wall posteriorly, between the right ureter and the right vesicula seminalis and vas, compressing the ureter. The mucous membrane of the bladder is thickened and irregular; the muscular coat is slightly hypertrophied. Both ureters are dilated, but the right much more than the left. 6479

Microscopic Structure.—The tumour is a squamous carcinoma.

From a man, aged 59, who was in U. C. H. under the care of Mr. Berkeley Hill in May 1889. The symptoms were of 4 months' duration, and consisted at first of increased frequency in micturition and pain in the tip of the penis after the act; for 2 months he had suffered from intermittent hæmaturia, the blood being passed usually in small clots. On admission the urine was alkaline, and contained blood and ½ albumen. A nodular tumour, chiefly to the right of the middle line, could be felt through the anterior wall of the rectum, and was thought to be the enlarged prostate. With the cystoscope a red strawberry-like mass was seen on the right side of the bladder. On the 9th day the patient vomited and wandered slightly. On the 10th he refused food, was at times unconscious, and developed clonic spasms in the limbs. Death occurred on the 12th day. The right kidney was shrunken and dilated; the left kidney was large and presented scattered abscesses in the cortex, the pelvis containing pus. There were secondary deposits of growth in the sacral and lumbar glands. (Surg. Reg. Rep. 1889, pp. 82 & 186, No. 914.)

1985. The right half of a male bladder, arising from the upper wall of which is a carcinomatous tumour, together with half a large calculus from the bladder. The tumour involves that part of the bladder which is covered by peritoneum, in an area measuring about 6 cm. in diameter. The growth projects into the bladder in the form of a rounded slightly lobulated mass, the surface of which, except around the margin, is superficially ulcerated. In its deeper part the growth involves the whole thickness of the bladder-wall, the remains of the muscular coat at the upper and lower borders of the growth being readily recognisable. Beneath the overlying peritoneum the growth projects in prominent nodules of varying size, smaller nodules of growth being also present on the surface of the peritoneum of the recto-vesical pouch. The cut surface of the tumour presents a yellow granular substance lying in a fibrous reticulum, continuous with two well-marked fibrous septa extending into the growth from the outer surface of the adjacent bladder-wall. The stone is nearly spherical, 5 cm. in diameter, and composed of oxalate of calcium and uric acid; the dark brown, irregular central parts of the calculus are surrounded by a paler zone of uric acid, in the centre of which and again on the external surface are separate thin strata of oxalate. 8173

Microscopic Structure.—The tumour is a squamous carcinoma.

From a man, aged 33, who was admitted into the Westminster Hospital under the care of Mr. Stonham, suffering from difficulty of micturition, rigors, and vomiting. The bladder was distended and the urine was alkaline and purulent. The patient soon became delirious, and died. There were secondary deposits of growth in the peritoneum of the recto-vesical pouch and on the under surface of the diaphragm, in the prevertebral glands and in the liver. There was suppurative nephritis, and the left lung was pneumonic.

1986. A male bladder, laid open in front, together with part of the abdominal wall of the suprapubic region. Except over a small area on the left side, the whole of the inner surface of the bladder is the seat of a new growth, which consists of irregular, friable masses of tumour-substance almost completely filling the lumen. From the bladder the growth has extended through the opening made in suprapubic cystotomy in the form of a considerable lobulated mass outside the bladder-wall and projecting through the integument. The muscular tissue of the bladder-wall appears to be almost entirely destroyed by the growth. The ureters are not dilated. 6800

Microscopic Structure.—The tumour is a small spindle-cell sarcoma.

From a man, aged 39, who was admitted into U. C. H. under the care of Mr. Heath, November 20, 1891. Four years previously he had suffered from painless hæmaturia for a fortnight; a month before admission the hæmaturia returned and was accompanied with frequent and painful micturition and occasional sudden stoppage of the stream in the middle of the act. On admission the urine was dark with blood, but no fragments of growth could be found in it; there was slight tenderness on pressure above the pubes. On November 24 the bladder was sounded with negative result; severe pain followed. On December 2 suprapubic cystotomy was performed and masses of growth weighing $1\frac{1}{2}$ ounces removed with the fingers and a flushing gouge. The bladder was drained. On December 30 further masses of growth were removed. The growth subsequently fungated through the suprapubic incision, and death occurred on January 9, 1892. There was suppuration in both kidneys; no secondary growths were found. (Mr. Heath's *Case-books*, 1892, vol. i, p. 557.)

STONE IN THE BLADDER.

SPECIMENS OF BLADDERS CONTAINING STONES.

A bladder containing a calculus presents nothing but the appearances before described as indicative of chronic cystitis. If the stone be very large some ulceration is occasionally found at the part where the stone has chiefly lain (1989). If the stone has existed for any length of time in the bladder there is always some hypertrophy of the muscular coat (1991). This, together with the thickening of the mucous membrane and submucous tissue surrounding the orifices of the ureters, offers more or less resistance to the entrance of urine into the bladder; and dilatation of the ureters and pelves of the kidneys, with chronic interstitial nephritis, occurs as a consequence.

Encysted Calculus.—In this condition the stone lies within a sacculus in the wall of the bladder (1992). It is probable that in most of these cases the sacculus is not formed by the stone, but a small stone, entering the bladder, has found its way into a pre-existing sacculus, or calculous matter has been deposited from the urine which stagnates in such a sacculus. In these cases, as the preparations show, it may be impossible to remove the stone without enlarging the mouth of the sacculus; and in so doing there is great danger of perforating the bladder.

1987. The bladder of a boy in which are two oval calculi, each about 3 cm. in length, which have lain apparently one above the other, the upper having a flattened end corresponding with the broad surface presented by the lower calculus on which it has rested. The section of the upper calculus shows that it consists of a pale fawn-coloured nucleus of uric acid surrounded by alternating layers of phosphate and uric acid.

The mucous membrane of the bladder is opaque and its muscular wall slightly hypertrophied. 2687

1988. A bladder with the prostate gland. The bladder is hypertrophied and fasciculated. The ureters exhibit dilatation with hypertrophy, but their vesical openings are not larger than natural. Lying within the neck of the bladder are two small, yellowish-brown calculi, one pyramidal, the other nearly cubical in form. The mucous membrane of the bladder is in parts superficially ulcerated. 785

Sir Charles Bell sounded the patient, an old gentleman, and proposed lithotomy, which was long deferred by the patient, who at last was in a very irritable state, running about his room in great pain. He underwent the operation; the next day he became insensible and died.

The dilated condition of the ureters shows that the kidneys had been subjected to considerable pressure, and were probably extensively diseased. The insensibility noted in the history was probably of renal origin.

Other calculi, besides those preserved in the specimen, were present in the bladder.

1989. A bladder and prostate gland, the lateral lobes of the latter being considerably hypertrophied, the left in excess of the right, so as to render the urethral orifice crescentic. The bladder is dilated and slightly hypertrophied: it contains two large oval calculi, each about 5 cm. in the longest diameter; the section of one shows it to be composed of alternating layers of pale uric acid and phosphates. A broad zone of the vesical mucous membrane is superficially ulcerated, and above this there are several small sacculi of the mucous membrane. The ureters are dilated. 789

1990. A bladder and prostate, the latter being greatly enlarged. The rounded, middle lobe of the prostate projects upwards into the bladder to such an extent as completely to conceal the orifices of the ureters, and in front overlaps the urethral aperture. The muscular coat of the bladder is considerably hypertrophied; its cavity is not dilated. In one situation the mucous membrane has been forced completely through the muscular coat, and forms a small external pouch situated above the orifice of the left ureter. The mucous membrane is opaque and thickened, but free from pigmentation or signs of acute inflammation, except over the middle lobe of the prostate, where it is superficially ulcerated. In the cavity of the bladder, to the right of the projecting prostate, is an exceedingly irregular calculus, formed apparently by the aggregation of many smaller spherical stones adhering one to another, and covered by a thin layer of phosphatic deposit. 1924

The bladder contained several other stones.

1991. A bladder and prostate. The bladder contains two flattened calculi, nearly 3 cm. in diameter, consisting of uric acid thinly coated with phosphates. The bladder is hypertrophied and markedly fasciculated. The mucous membrane is irregularly ulcerated and projects between the fasciculi so as to form numerous sacculi. In many parts the sacculi themselves appear to have been ulcerated and form irregular cavities in the substance of the bladder-wall. The outer wall of these cavities consists in many parts only of the peritoneal covering of the bladder and is quite translucent, and their openings into the bladder are bridged across by undestroyed bands of mucous membrane. The peritoneum of the bladder is covered in parts with a layer of inflammatory exudation, and in other parts presents irregular surfaces from which adherent coils of intestine have probably been separated. 786

The patient stated that he had suffered for many years from stricture, and his water constantly dribbled from him. He was in a state of extreme suffering.

1992. A bladder and prostate, the former having been laid open posteriorly. About 15 mm. above the orifice of the right ureter is the rounded orifice of a sacculus, 6 mm. in diameter. The sacculus has an external measurement of 4·5 cm., the wall being chiefly composed of indurated areolar tissue, to the upper aspect of which the vas is adherent. The sacculus is completely filled by an irregularly oval calculus, coated with a granular layer of phosphates. The mucous membrane of the bladder is thickened and presents small adherent patches of phosphatic deposit. 4274

✓ **1993.** A bladder and penis, the penile urethra having been laid open through its floor and the incision prolonged through the right side of the prostate into the bladder. The prostatic portion of the urethra is greatly dilated and occupied by the lower and larger extremity of an irregularly hour-glass shaped calculus. The upper and smaller extremity of the calculus projects into the cavity of the bladder, the two portions of the calculus being united by a constricted part which occupies the neck of the bladder. The whole calculus measures 6·5 cm. in length, and the part of it which occupies the prostatic urethra has a diameter of 4 cm. The membranous portion of the urethra is also dilated, and from it a fistula indicated by a glass rod leads to the lower end of a scar in the perineum resulting from a previous operation of lateral lithotomy. The bladder is contracted and slightly hypertrophied; its mucous membrane and that of the prostatic urethra is much thickened by chronic inflammation. The ureters are dilated and thickened. (See No. 1994.) 788

1994. Two calculi which had been previously removed by operation from the preceding specimen. Each calculus is 4 cm. by 2·3 cm., but they are very different in form, the upper being oval and the lower appearing to be composed of two parts amalgamated together. The two calculi articulate and much resemble the calculus which formed in the bladder subsequently to the operation (No. 1993). The calculi are composed chiefly of mixed phosphates, but the rounded part of the lower calculus has a nucleus of uric acid.

From a man, aged 22, in whom lithotomy had been performed two years before death.

1995. The kidneys, ureters, and bladder from a man who died of calculous disease. In the right kidney the dilated pelvis is completely filled by a uric acid calculus thinly covered with phosphates; the calices are moderately dilated, and in the highest is another small calculus; the ureter is slightly dilated and thickened. In the left kidney the pelvis and calices are dilated, and at both extremities the renal substance is much thinned. The left ureter is more dilated than that of the opposite side; immediately above its entrance into the bladder the ureter contains two small calculi, the larger of which is about the size of a hazel nut; at a higher level the ureter is blocked by a spindle-shaped calculus, 2·7 cm. in length. The bladder is contracted and slightly hypertrophied; its cavity is completely filled by a large calculus half of which has been left *in situ*. The whole stone, which consists of two calculi feebly united, has an irregularly pyramidal outline (5·5 cm. × 5·5 cm.), the smaller extremity occupying the neck of the bladder. The upper half of the calculus has a somewhat oblong shape, the lower half being ovoidal, the slightly convex upper surface of the latter fitting against the concave lower surface of the former. Each part of the stone presents a fawn-coloured uric acid nucleus surrounded by concentric laminæ varying in colour and covered superficially by a rough greyish-white layer of phosphates. 6624

The patient was the subject of heart-disease and no operation was performed.

1996. The bladder of a male child, containing a calculus. The bladder is moderately contracted; the mucous and submucous coats are thickened, and the muscular coat hypertrophied; the ureters are dilated and thickened. The calculus is elongated and measures 7 cm. in length. The larger extremity, which fills the bladder, measures 3 cm. × 2·5 cm.; this part of the stone is continued below into a narrow portion which occupies the neck of the bladder; beyond this the stone is slightly enlarged into a cylindrical portion, which occupies the dilated prostatic portion of the urethra and terminates in a small, slightly bulbous extremity which evidently projected into the membranous urethra. The whole stone is of a pale yellow colour and the surface, especially of that part which lies in the bladder, is rough and irregular. 7811 A

From a boy, aged 8½, who was admitted into U. C. H. under the care of Sir T. Barlow, May 5, 1897. For 3 months the boy had suffered from wasting, diarrhœa, with occasional prolapse of the rectum, painful micturition, drowsiness and occasional vomiting. On admission there was continuous involuntary escape of urine with almost constant priapism; there was irregular fever, maximum 103°; the urine was acid and contained pus. On rectal examination a hard mass could be felt in the region of the bladder, but on account of the child's condition further investigation was impossible. Death occurred on May 30. Both kidneys were dilated and the seat of suppurative pyelo-nephritis; an abscess around the left kidney extended upwards beneath the diaphragm; the base of the left lung was covered with inflammatory exudation. (Sir T. Barlow's *Case-books*, Children, 1897, p. 344.)

CALCULI FROM THE BLADDER.

The calculi preserved in the Museum include collections presented by Mr. Liston, Mr. Richard Quain, Sir J. E. Erichsen, Mr. James Arnott, and Dr. John Creighton, and large collections of calculi removed in India by Lt.-Col. F. C. Barker, Dr. Rustomjee Byramjee, Mr. Carter, and Mr. Lobb.

A large number of the stones were submitted to chemical examination by Dr. John Harley. The majority of the specimens comprising the above collections were fully described in the first edition of this Catalogue, which can be consulted in the Museum.

The specimens included in the following series have been selected from the Collection with the object of displaying the most important features and varieties of vesical calculi.

General Characters of Vesical Calculi.

Number, Size, and Form.—Minute calculi, usually of renal origin and often in considerable numbers, may be passed naturally *per urethram*. Such stones are generally of a definite rounded form, like millet-seeds, and are sometimes called "miliary calculi" (1997). Much larger stones are occasionally passed from the bladder without surgical interference (2000). A stone allowed to remain in the bladder may occasionally attain enormous proportions and be moulded to the form of the distended bladder (2001, 2002). Single calculi are of round or oval form and usually more or less flattened (2003). Occasionally they may assume an hour-glass figure from having lain partly in the bladder and partly in a sacculus, or in the neck of the bladder (2004). Multiple calculi are usually of irregular form, angular with flattened sides, or, as it is called "facetted" (2005); this is due, in most cases, not so much to friction as to want of deposit in those parts of the stone which have been in contact.

In some cases, however, friction has evidently been partly the cause of the form assumed, a concave polished surface on one stone being adapted to a convex surface on another. This appearance is spoken of as "articulation of calculi" (2006). It is most common when the stones have been impacted in the neck of the bladder (1994), or have lain in a cyst or sacculus. It must be remembered, however, that two or more stones may be found in a bladder each presenting the rounded form of a single calculus.

Surface.—The character of the surface of a vesical calculus chiefly depends upon the chemical composition of the stone. The surface may be smooth or even polished (2015), roughly granular (2024), crystalline (2040), nodular (2030), or jagged and irregular (2028).

Structure.—A calculus may in section present a uniform structure throughout (2007), but much more commonly it consists of a distinct nucleus, usually of renal origin, surrounded by concentric laminæ, varying often in density, colour, and chemical composition (2009). In rare cases the nucleus is double or even multiple (2001), and occasionally it is a foreign body (1943). When the body of a calculus consists of concentrically arranged layers varying in composition, the calculus is called an "alternating" calculus; such a formation results from changes in the condition of the urine in which the stone is deposited (2012).

Stones in the bladder in very rare cases break up spontaneously into angular fragments, the lines of cleavage always radiating from the nucleus (2013). This seems to be due to shrinking of the stone taking place in its central parts. Several specimens here exhibited show a series of loose layers around the nucleus, from which start fissures either reaching or nearly reaching the surface. That these fissures existed while the stone was in the bladder is shown by the fact that they may contain a deposit of phosphates (2014). In one specimen the nucleus is separated from the surrounding layers by a space, so that it rattled inside the stone before it was sawn through (2015). This can only have taken place as a consequence of shrinking of the nucleus. It will be noticed that all the calculi illustrating spontaneous fracture are composed entirely or chiefly of uric acid.

Chemical Composition.—The following are the substances entering into the formation of human urinary calculi:—uric acid, urate of ammonium, oxalate of calcium, phosphate of calcium, and ammonio-magnesic or triple phosphate, and as rarer substances, cystine, xanthine, carbonate of calcium, and indigo. Of the three most common constituents of urinary calculi, oxalate of calcium is the most opaque to X-rays, uric acid the least opaque, and phosphates intermediate in opacity between the other two (2016).

This series of specimens illustrates the general characters of vesical calculi, and is followed by a series of specimens arranged according to their chemical composition.

✓ **1997.** Many hundreds of minute calculi of rounded and regular form, about the size of millet-seeds. They are composed of pale uric acid, and were undoubtedly formed in the kidney. 2623

1998. A number of small uric-acid calculi which were passed by the urethra. 3453

1999. Eight small uric-acid calculi, the largest of which is about 8 mm. in diameter, passed at various times by the same patient. They are smooth on the surface, of rounded form, and dark-brown colour. 5451

2000. Four uric-acid calculi passed by the urethra at various times. The largest measures 16 mm. × 9 mm., for the most part it is smooth on the surface. The smaller stones are angular in form and dark-brown in colour. 3455

2001. A very large ovoidal calculus, measuring 10·7 cm., 9 cm., and 7·5 cm. in its three chief diameters, its greater circumference being 28·5 cm. and its lesser circumference 26 cm. In its present condition the stone weighs 22 ounces, when first removed it weighed 25 ounces. The natural surface of the stone is very slightly tuberculated and of a pale yellowish-brown colour. In parts of the calculus in which the surface has been accidentally broken away it is seen to be laminated and nearly white in colour. It is composed almost entirely of phosphates. 7836

The stone was sent to Mr. Heath from India by Surgeon-Captain E. Jennings, I.M.S. It was removed by suprapubic lithotomy. The patient died.

2002. A cast of a very large vesical calculus. It measures 40 cm. in the long circumference and 30 cm. in the short. Its chief diameters are 16·5 cm. and 10·5 cm. It is pyriform in shape; the smaller end is smooth; the larger is slightly lobulated. 5092

The stone was removed from a man, aged 39, by Uyterhœven of Brussels, by suprapubic lithotomy. The patient died on the 8th day.

2003. A uric-acid calculus having the flattened ovoidal form most commonly met with in single calculi. It is pale brown in colour and has a surface like that of a granular kidney. 3519

From a boy, aged 5½ years. It was successfully removed by Mr. Liston by lateral lithotomy. The size of the stone necessitated bilateral division of the prostate, and even then it was removed with difficulty.

2004. A cast of a calculus the weight of which was 7 ounces. The part marked A was contained in a pouch projecting from the lower part of the bladder; the part marked B was in the bladder. 3495

Removed by operation.

✓ **2005.** Fifty calculi removed by operation from the bladder. They are facetted and present smooth, triangular or rhomboidal surfaces. The largest calculus measures 16 mm. in length. Most of the calculi that have been broken show the same structure—a spherical, or almost spherical, reddish-brown nucleus, evidently composed of uric acid, and of renal origin; around this are darker layers, arranged concentrically about the nucleus, and composed of phosphate of calcium; finally each calculus is coated with mixed phosphates formed in the bladder while the stones have been in mutual apposition, and, consequently, deposited in smallest quantity where they have touched each other. It is to this layer that the angular and facetted form is due.

From a man, aged 54, who was admitted into U. C. H. under the care of Sir J. E. Erichsen, July 1870. Seven years before admission he began to pass gravel in the urine, and had subsequently passed about 100 small calculi, and had suffered from painful micturition, with occasional attacks of hæmaturia and obstruction to the outflow of urine. On admission micturition was very frequent and the urine contained large quantities of mucus and pus. The sound revealed the presence of a large number of small calculi. On July 11 median lithotomy was performed and the stones preserved in the specimen removed. After a slow recovery the patient left the hospital without leave on August 7. In December 1870, and again in June 1871, several more small stones were crushed; there was still cystitis. On August 25, 1871, while washing out his bladder, he was seized with sudden pain followed by acute peritonitis, of which he rapidly died.

2006. A cast of five calculi articulated one with another. The largest stone is cuboidal and supports the other four (one of which is missing). The whole mass measures about 8 cm. across. 5090

2007. A large uric-acid calculus in section (6·5 cm. × 5 cm.), somewhat flattened in form, with a polished brown surface studded with smooth round nodules. The calculus is of uniform structure and composed entirely of concentric laminæ of uric acid. 3508

From a man, aged 80, who was admitted into U. C. H. under the care of Mr. Liston. He had suffered from urinary symptoms for ten years, when he noticed a deposit of gravel in his urine and pains in the loins and penis. Soon after he had retention of urine for thirty-six hours, which ceased on his passing two small stones. From that time he occasionally passed small stones till two years before admission, when the sandy deposit in the urine ceased. The stone was recognised in the bladder by a surgeon at Rochester a few weeks before admission, and attempts were made to dissolve it by injections into the bladder, which gave the patient great pain. Mr. Liston performed lateral lithotomy, the size of the stone obliging him to divide both sides of the prostate gland. The patient recovered.

2008. A flattened ovoidal calculus (6·5 cm. × 5·3 cm.), in section. The nucleus is brown in colour, spinous in outline, polished on the cut surface, concentrically laminated and composed of oxalate of calcium. The nucleus is surrounded by a thick layer of phosphates, the greater part of which is faintly marked by laminæ parallel to the surface of the calculus, only the deepest laminæ following the outline of the nucleus.

From a sailor, aged 27, who was admitted into U. C. H. under the care of Mr. Beck, in Dec. 1889. He had suffered from painful and frequent micturition for two years, and on two or three occasions had passed blood in the urine. The symptoms had become much more severe during the two months before admission. On admission the patient was suffering from intense cystitis and the stone was detected with a sound. Suprapubic lithotomy was performed. The patient was discharged on the 43rd day, the wound being firmly healed and the symptoms entirely relieved. (Surg. Reg. Rep. 1890, p. 204, No. 2488.)

2009. A spheroidal calculus consisting of a small uric-acid nucleus surrounded by a very irregular deposit of oxalate of calcium, and outside this by a layer of phosphates, which has filled up its irregularities. 3661

The patient was a man, aged 28 years. Symptoms of stone had existed for eleven years, and during that time the man had three attacks of inflammation of the bladder. He thought that these attacks were made worse by his occupation as a cook. For the last five years he had lived in Australia, and he came to England to be operated upon after a stone had been found in his bladder. He stated that at times he had lived much on vegetable food. He entered the hospital April 29, 1847, and Mr. Liston performed lithotomy on May 1. He was discharged, cured, on June 6.

2010. An oval calculus measuring 4·4 cm. × 2·7 cm. It contains six nuclei of pale uric acid, two of which are very small; the nuclei are bound together by concentric layers of phosphates, the whole being surrounded by a laminated crust consisting of phosphate of calcium with a trace of uric acid.

2011. Half an oval phosphatic calculus, 2·5 cm. in length. In its centre is a small rounded cavity containing a fragment of tissue. 8581

From the bladder of a woman in whom several operations were performed for the cure of a vesico-vaginal fistula. The stone was removed through the fistula.

2012. A large oval calculus, 6 cm. × 4·6 cm. The surface of the stone is brown, rough and slightly nodular. It is dense, slightly laminated, and composed of uric acid, except in a zone 2 mm. in thickness midway between the centre and the surface, which is white in colour, less compact and composed of phosphates.

The deposit of the layer of phosphates was probably coincident with an attack of cystitis.

2013. An irregularly oval calculus 5·2 cm. × 4 cm. The stone is traversed by numerous fissures radiating from the nucleus, and dividing it into wedge-shaped sections. Most of the fissures reach to the surface, but they are wider towards the centre, giving the idea that the central parts of the stone have undergone considerable shrinking. That this shrinking occurred, in part at least, while the stone was in the bladder, is shown by the fact that some of the fissures are more or less completely filled in with phosphatic deposit. The laminated deposit of uric acid, of which the bulk of the stone is composed, is thus broken up into segments by layers of phosphates, just as the bricks in a wall are separated by the mortar. The crust of the stone is unbroken. It is surrounded by an imperfect mortar-like layer of mixed phosphates.

The stone was removed from the bladder after death, but there is no further history. It is an excellent example of the spontaneous fracture of calculi. (For a description of similar specimens and an account of this process in uric-acid calculi, see Dr. Ord, Trans. Path. Soc. 1878, 1879, and 1890.)

2014. An oval calculus, 3·4 cm. × 2·7 cm. The oval, uric-acid nucleus has undergone spontaneous fracture, the four fragments being slightly separated and the interval between them filled with a greyish deposit, probably composed of a mixture of uric acid and phosphates. A layer of similar deposit completely surrounds the nucleus, and outside all a nearly white layer of phosphates. 9185

2015. A large oval somewhat flattened calculus, smooth on the surface, measuring 5 cm. × 4 cm. The nucleus is composed of urate of ammonium; this is covered by a layer of oxalate of calcium 4 mm. thick, all beyond which is uric acid. The nucleus with its surrounding oxalate has separated from the uric acid, and rattled in the stone before the section was made. 3399

Successfully removed by Mr. Liston from a man, aged 19.

2016. Halves of three calculi composed of oxalate of calcium, mixed phosphates, and uric acid respectively, together with a radiogram of the same. The opacity to the X-rays is seen to be in the above order. 9527

URIC ACID CALCULI.

These form by far the greater number of calculi composed of a single chemical constituent; and uric acid enters into the composition of the nucleus of a large proportion of mixed calculi. Altogether uric acid is present in more than two-thirds of all urinary calculi. Uric acid varies in colour from a dark brown (2017) to almost pure white (2018), the most common tint being fawn-colour (2019). The difference in tint is due to the amount of colouring-matter present in the urine. Uric acid readily absorbs the pigment in the urine, consequently white stones of this composition are very rare, and when they do occur they may be mistaken, without chemical examination, for phosphatic calculi. Uric-acid calculi are usually rounded or oval in form, and smooth (2019) or slightly nodular (2020) on the surface. A section shows them, in most cases, to be composed of a distinct nucleus surrounded by concentric laminæ (2021); but occasionally the lamination is indistinct or even wanting. The density varies greatly, and the different layers of the stone may vary in hardness. The calculus may be so hard as to take a high polish on the section.

Uric-acid calculi are frequently multiple (2022).

The formula for uric acid is $C_5H_4N_4O$.

2017. Half an oval uric-acid calculus, measuring 4·8 cm. × 3·8 cm. It is composed of dense, dark brown, concentric layers of uric acid. The surface is slightly nodulated and dark brown in colour.

From India.

2018. A small elongated calculus, measuring 3·2 cm. × 1·6 cm. It is composed of nearly white uric acid, almost resembling phosphates in appearance. About midway between the surface and the centre there is a narrow pale fawn-coloured zone. A small nucleus is recognisable towards one end of the central part. The surface is porous and grey in colour. 3660

The patient was a boy, aged 3½ years, who had the usual symptoms of stone in the bladder for about one year and a half before his admission into U.C.H. Lateral lithotomy was performed on February 19, 1847, and the patient left cured March 31, his recovery having been delayed by an attack of orchitis.

2019. Half a pale fawn-coloured uric-acid calculus, measuring 4·3 cm. × 3·3 cm. The surface is smooth and the sawn surface marked with concentric laminæ varying slightly in tint. 3403

Removed by Mr. Liston. There was a second similar stone in the bladder.

2020. Half a large oval uric-acid calculus, measing 6·2 cm. × 5 cm. The surface is brown and nodular; the sawn surface presents concentric lamination, the outer layers being radially fissured. 2775

Removed successfully by Mr. Liston from a man, aged 78.

2021. Half a small uric-acid calculus, measuring 3·2 cm. × 2·8 cm. The sawn surface shows very well marked concentric lamination, the layers varying in colour between pale fawn and dark brown. 3439

Removed successfully by Mr. Liston from a man, aged 65.

2022. Seventeen calculi composed of pale uric acid. The calculi generally are about the size of marbles. They present numerous facets formed by their lying in close contact in the bladder. All the stones that have been sawn through show a very small nucleus surrounded by layers of varying colour, but generally becoming lighter towards the surface. 3432

Successfully removed by Mr. Liston from a man, aged 70.

URATE OF AMMONIUM CALCULI.

These are rare. They most commonly contain in addition traces of urate of sodium and calcium. They are usually of a pale greyish fawn-colour, but sometimes closely resemble a piece of pipe-clay (2023). In form they are rounded or oval and smooth on the surface. They may so closely resemble uric-acid calculi that their true nature can only be ascertained by chemical examination. Urates, although rarely forming a pure calculus, are common in mixed stones. They are soluble in a sufficient quantity of boiling water.

The formula of acid ammonium urate is $C_5H_3N_4O_3(NH_4)$.

2023. A soft, clay-coloured calculus, very loose and irregular in construction. It is composed of pure urate of ammonium, and measures 3·6 cm. × 2·7 cm. It is of irregular form, with a large projection on one side, of uniform colour, distinctly laminated, and deeply fissured between the laminæ. Its surface is rough and marked by a few prominent nodules; its substance is moderately hard. 1753

2024. An oval calculus, in section, measuring 5 cm. × 4 cm., and composed of urate of ammonium, with a trace of ammonio-magnesium phosphate. The nucleus is loose in structure, and devoid of lamination. The outer layers are brown in colour, more distinctly laminated and slightly more compact, and are crossed by fine clefts diverging from the centre to the circumference of the calculus. The surface is finely and uniformly granular. 3402

2025. Half a flat oval calculus, measuring 4·3 cm. × 3·1 cm. It is composed of urate of ammonium, the outer layers of which are impure. The greater part of the stone is somewhat porous in structure, and indistinctly laminated. It is a faint brown colour. The outermost layer is denser in structure and darker in colour; the surface is finely granular. 514

From a man, aged 30.

XANTHINE CALCULI.

These are of extreme rarity. They are moderately hard, of a reddish-brown colour, and may be polished by friction (2026).

The formula of xanthine is $C_5H_4N_4O_2$.

2026. Some fragments of a xanthine calculus. The stone has broken with a brittle angular fracture. It is distinctly laminated. One of the fractured surfaces of the largest fragment is slightly polished. The fragments are all of a pale liver-colour. 3480

The stone, which was as large as a pigeon's egg, was removed from the bladder by Prof. Langenbeck of Berlin.

OXALATE OF CALCIUM CALCULI.

Oxalate of calcium is, next to uric acid, the commonest constituent of primary calculi. The commonest form of oxalate of calcium calculus found in the bladder is that known as the "mulberry calculus." The calculus is rounded, exceedingly dense, hard and heavy; its surface presents large irregular tubercles, often terminating in numerous small secondary tubercles; the colour of the stone varies from pale brown to dark brown or almost black and is due to altered blood-pigment (2027, 2028). On section a mulberry calculus is usually distinctly laminated, the central laminæ being regular and the outer laminæ displaced in correspondence with the tuberculated surface (2027). Occasionally the whole stone is granular and wanting in lamination. In another form of oxalate of calcium calculus the surface is crystalline (1884 A) and, especially as met with in the kidney, may be pure white in colour. Other forms of oxalate of calcium calculi, occasionally found in the bladder but more commonly in the kidney, are the so-called "hemp-seed calculi," which are small, rounded and smooth, and those in which sharp spinous processes project from the surface (1878).

The formula of oxalate of calcium is $C_2CaO_4 + 2H_2O$.

2027. A pure oxalate of calcium calculus of a pale brown colour, the surface of which is studded with very prominent tubercles. It measures 3·5 cm. in diameter. The oval nucleus is surrounded by alternating darker and paler layers with delicate wavy borders. The arrangement is fairly regular in the central part of the stone, but in the outer part the laminæ become distorted in correspondence with the marked projections on the surface. The distortion seems to have been caused by the deposition of small nodules on the surface of the stone over which the laminæ deposited later are continuous. 5383

2028. A mulberry calculus, with a very irregular nodular surface, resembling the preceding in appearance. It is much darker in colour, the surface being nearly black, except at the extreme points of the processes, where the colour is paler. Its cut surface shows the same arrangement of lamination as in the preceding specimen and has taken a smooth polish. It is composed of pure oxalate of calcium. It weighs 330 grains and measures 3·2 cm. in diameter. 3656

This stone was removed from the body of a vegetarian, aged 62, after death. During life he had not complained of any symptom indicating the presence of a stone.

2029. Half an oval calculus, composed of pure oxalate of calcium, and measuring 3·5 cm. × 3 cm. It has a dense nucleus of irregular outline, measuring about 14 mm. in its greatest diameter. This is surrounded by a pale brown zone, hard but somewhat porous, indistinctly laminar, and measuring 8 mm. in thickness. Upon this is a thin dark brown layer of similar composition. The surface is rough and granular, and almost black in colour, with here and there a thin deposit of phosphates. The stone is composed of pure oxalate of calcium. 3720

From a man, aged 52, who was operated upon by Mr. Quain. He died six weeks after the operation, and the bladder was found to be the seat of a cancerous tumour.

2030. An oxalate of calcium calculus, quadrilateral in section, and measuring 3 cm. across. The surface is studded with irregular rounded nodules. The calculus is of a pale fawn-colour and is composed of laminæ varying in density and tint arranged around a small irregularly oval nucleus, 7 mm. in diameter. 3481

2031. A cast of a large mulberry calculus. 5088

PHOSPHATIC CALCULI.

Whenever the urine becomes alkaline from any cause, whether from the presence of excess of carbonate of sodium or potassium, or from the formation of carbonate of ammonium from urea in alkaline fermentation of the urine, or from the presence of a great excess of alkaline mucus, basic phosphate of calcium or bone-earth, $Ca_3(PO_4)_2$, is deposited as an amorphous white sediment. In all cases in which the alkalinity is due to decomposition, the ammonio-magnesium or triple phosphate is also deposited, $NH_4^{\cdot} . MgPO_4 + 6H_2O$. The phosphate of calcium has very little tendency to form a calculus by itself. It is readily passed from a healthy bladder or kidney. It does, however, occasionally occur pure in the form of a calculus. Such stones are white or whitish grey, soft and friable, and usually laminated (2033). The ammonio-magnesium phosphate is also in rare cases found forming a calculus. The stone is soft and friable and crystalline in structure; the surface is often studded with shining crystals (2034). Far more commonly the two phosphates are found mixed together in varying proportions. When the ammonio-magnesium phosphate is in great excess (at least two parts to one of the phosphate of calcium), the mixture fuses into a clear bead before the blowpipe, and such stones have received the name of "fusible calculus" (2036, 2037). More commonly the phosphate of calcium is in excess, and the mixed phosphatic calculus so formed will not fuse. Mixed phosphatic calculi not unfrequently contain a trace of carbonate of calcium. They are white in colour, as the phosphates have no affinity for the colouring-matter of the urine. They are soft and friable, often hardly deserving the name of a stone, and are irregular on the surface (2038, 2039). All stones, of whatever nature, and all foreign bodies, if they be sufficiently long in the bladder, give rise to chronic inflammation, with secretion of an excess of alkaline mucus, sooner or later followed by alkaline fermentation of the urine. Consequently almost all calculi, of any size, and all foreign bodies become coated with a covering of mixed phosphates, most commonly containing an excess of phosphate of calcium.

(a) *Calculi of Phosphate of Calcium.*

2032. Half a small oblong calculus, measuring 2·3 cm. × 1 cm., composed for the greater part of pure phosphate of calcium. The superficial layers contain a small quantity of ammonio-magnesium phosphate. It is irregular in form, rough on the surface, friable in consistence, and white in colour. Its lamination is very indistinct. 3390

The patient was a man, aged 70. The bladder also contained two small calculi, composed chiefly of triple phosphate, probably formed at the same time that the triple phosphate was deposited on the larger stone (see No. 2035).

2033. A calculus, of about the size and shape of a pigeon's egg, composed of phosphate of calcium. Its superficial laminæ are white and polished; many of these layers, which resemble egg-shell, have been broken away, so as to expose the deeper part of the stone, which is of a greyish tint.

Given to Mr. Liston by M. Civiale of Paris.

(b) *Calculi of Ammonio-Magnesium Phosphate.*

2034. Two calculi, removed after death from the bladder. The larger weighs 5½ ounces, and measures 7 cm. × 5·5 cm.; the smaller measures 4·8 cm. × 4·2 cm. The larger is somewhat rounded in form, and has a depression on one side, in which the flat, smaller stone lay. At one part the surfaces which were in contact are worn smooth. There are two smaller depressions on the larger stone, possibly due to the smaller calculus having at some time lain in them. The stone is white in colour, soft and crystalline in structure, and is a good specimen of a calculus composed of crystalline ammonio-magnesium phosphate. 3518

From a man, aged 61, admitted into U. C. H. under the care of Mr. Quain. Thirty years before, he had gonorrhœa, which left a stricture. For twenty years he had had a deposit in his urine, with pus and occasionally blood. On admission he was found to have so narrow a stricture that no instrument could be passed. His urine constantly dribbled from him, and he suffered incessant pain in the glans penis, perineum and testicles, and occasionally in the groins. The urine was passed in good quantity. It was not very clear, and deposited mucus on standing. It contained gravel in pieces about the size of a pin's head. All attempts to pass instruments failed, and the man became gradually worse, and died comatose on February 14, 1842, having been 7 days in the hospital.

Post mortem Examination.—The bladder was much thickened, and its mucous membrane ulcerated. There was an enormous quantity of pus in the cellular tissue of the pelvis around the bladder. The left ureter was dilated and tortuous, and the corresponding kidney nearly destroyed and its pelvis greatly dilated. The opposite kidney was granular and small. The stricture was just in front of the bulb, an inch in length, tight and of almost cartilaginous hardness.

2035. Two small calculi, with irregularly triangular surfaces. They consist entirely of ammonio-magnesium phosphate; they are rough on the surface, porous in structure, and not laminated. 3416

From the bladder of a man in which there was another stone composed of phosphate of calcium (see No. 2032).

(c) *Calculi of Ammonio-Magnesium Phosphate and Phosphate of Calcium, the former being in excess (Fusible calculi).*

2036. A very irregular spongy mass of phosphates (chiefly fusible), forming a soft calculus, measuring 4·5 cm. × 2·3 cm., and weighing 182 grains. It is of a dirty white colour, and presents in parts an imperfect lamination. Its surface is rough and porous. 5118

2037. A large irregular calculus with somewhat triangular surfaces, measuring 6 cm. in its longest diameter. It has a rough irregular exterior. The section presents a uniform white chalk-like appearance, with scarcely a trace of lamination, and no nucleus. It is composed of ammonio-magnesium phosphate and phosphate of calcium, and fuses readily before the blowpipe. 2618

(d) *Calculi composed of Ammonio-Magnesium Phosphate and Phosphate of Calcium, the latter being in excess.*

2038. Half a calculus of a regular oval form, measuring 4 cm. × 3·2 cm. It has a small oval nucleus of a faint grey colour, surrounded by a dull white mass of close, but not firm, structure and distinctly laminated. 1117

2039. An ovoidal stone, 3·3 cm. × 2·5 cm. The divided surface is nearly white and friable, and displays a nucleus composed of ammonio-magnesium phosphate and phosphate of calcium with a trace of urates. Surrounding this is a chalky-looking layer, containing both kinds of phosphates without urates and with a trace of carbonate of calcium. Superficially to this the stone has the same composition as its nucleus. The external surface is rough, with small sharp projections upon it.

The stone was removed by Mr. Liston from the bladder of a boy, 10 years of age, who had suffered from symptoms of stone from the time he was one year old. Three years before Mr. Liston saw him, he was operated on by Mr. Aston Key by the left lateral operation, and the stone, which was very friable, broke in the extraction. Mr. Liston operated May 11, 1846, by the right lateral incision in the perineum.

CYSTIN CALCULI.

Cystin is a rare constituent of urinary calculi. It has been found either pure or mixed with phosphates. It crystallises in hexagonal plates, and is soluble both in caustic alkalies and strong mineral acids. It contains sulphur as one of its constituent elements, its formula being $C_3H_7NSO_2$. Cystin calculi when freshly removed are of a pale yellow colour, semitransparent and crystalline in appearance; but after exposure to air they become green and opaque (2040, 2041). In some specimens the central parts only present the characteristic crystalline appearance, the surrounding parts being laminated and opaque yellow in colour; but even in these layers a careful examination with a lens shows a distinct crystalline structure. These opaque layers are usually mixed with a small quantity of phosphates. A similar appearance, however, may be met with without a trace of lime being present. The stone, when rubbed with a handkerchief, gives out a strong garlic-like smell.

Cystinuria may be hereditary.

2040. Half a calculus composed of pure cystin, measuring 5·2 cm. × 3·3 cm. The half shown weighs 265 grains. It exhibits the crystalline structure characteristic of such calculi, and is rough and nodular on the surface, looking almost like crystallised sugar. The surface of the section is smooth and polished, and has a semitransparent waxy appearance; the parts exposed to the light have become of a dark green colour. The original colour was amber-yellow. There is no distinct lamination. 3457

Removed by Mr. Liston in Edinburgh, from a man, aged 37. None of his family had suffered from stone.

2041. Two small cystin calculi, together with numerous fragments of another calculus, from the same case. The two complete calculi present the characteristic crystalline appearance and greenish colour of cystin. The fragments of the other stone are slightly whitened on the surface from the presence of phosphates deposited after the calculus had been crushed. 3620

The stones were formed in the bladder of a young man, aged 19 years, a native of Herefordshire. Symptoms had existed for many years. No other member of the family had stone in the bladder. The operation of crushing was repeated five times, and required great force. Dr. Prout examined the calculus, and found it to consist for the most part of cystin. In the fragments of the large calculus he found slight traces of an alkaline residuum after combustion (probably due to phosphatic deposit consequent upon some cystitis and alkalinity of the urine following the operations of lithotrity). In the small calculus the cystin was somewhat modified, a modification Dr. Prout thought due to the presence of water combined, perhaps, with the cystin. The operation was performed by Mr. Liston.

2042. An impure cystin calculus (5·7 cm. × 4·4 cm.) in section. The surface is rough and broken. In the centre of the divided surface is an irregular area presenting a porous crystalline structure, somewhat waxy-looking and greenish in tint. The rest of the stone is dense and compact, and marked by distinct laminæ, the broader laminæ being grey and the narrower a faint green tint. When friction is applied the stone emits a strong garlic-like odour. The stone consists of cystin and phosphate of calcium. 2621

There is no history to the specimen. (H. Bence Jones, Med.-Chir. Trans. vol. xxiii, 1840, p. 192.)

2043. Halves of two cystin calculi, together with the whole of a small one. The largest stone measures 2·6 cm. × 2·2 cm., and weighed when entire 130 grains. It is perfectly smooth on the surface, and of a pale stone-colour. The section shows the greater part of the stone to be made up of a browish-yellow semi-transparent crystalline mass devoid of lamination. This is enclosed in a crust, 3 mm. in thickness, of a different construction, compact, very finely laminated, and of a pale stone-colour, but composed, like the rest, of pure cystin. The middle-sized stone measures 1·5 cm. in its greatest diameter, and is nearly circular in form; it weighed when entire 39½ grains. In structure it exactly resembles the largest. The smallest stone measures 1·3 cm. × 9 mm. It is nodular in form, and evidently composed of several smaller calculi fused together. It has a waxy lustre and is of a yellowish-white colour, and is covered on the surface with sparkling crystals.

The patient, a man, aged 28, was admitted into U. C. H. on June 8, 1875, under the care of Mr. Heath. Two years previously he was under medical treatment for supposed affection of the kidneys, and passed some blood; and one year before admission some small stones, not so large as peas, were passed. He had been in good health until the day before admission, when he had retention of urine, and Dr. Derry Jones, who was called in, passed a catheter and drew off the water, feeling at the time calculous matter in the urethra. Retention recurring, he was brought to the hospital, when a catheter again touched a stone. The same afternoon he was cut in the median line by Mr. Heath, who, on passing his finger into the wound, hooked out of the prostate, partly with his finger and partly with the scoop, sixteen calculi of irregular shape (not preserved). Passing a sound into the bladder, three other calculi were detected, and removed with forceps. The patient had an attack of hæmorrhage a week after the operation, and recovered slowly, not leaving the hospital till August 11. Three days after the operation some cystin crystals were found in the urine, but none again after that. (Trans. Path. Soc. vol. xxvii, 1876, p. 306.)

After the operation the man had no further trouble till the summer of 1877, when he began to suffer from pains in the back and bladder. Mr. Heath on two occasions crushed some small fragments of cystin, but the patient refused to enter the hospital till July, when he was admitted in a dying state. At the *post mortem* examination the liver was amyloid and somewhat enlarged. The bladder was in a state of acute inflammation, and contained rough fragments of stone. The ureters were dilated with a cystin stone in each of the size of a cherry; the calices were greatly dilated, and evidences of old nephritis were found in the right kidney; acute pyelitis existed in the left, the organ being distended with pus. The calculi were irregular masses of a fawn-colour, and much less dense than those removed by operation. Examination of the urine on several occasions before death had shown the presence of cystin crystals. (Trans. Path. Soc. vol. xxix, 1878, p. 154.)

Carbonate of Calcium Calculi.

Calculi composed of pure carbonate of calcium ($CaCO_3$) are extremely rare in man. In the Herbivora they are comparatively common (2044). When found in man they are usually small and multiple, of pure white colour, and very dense. Prostatic calculi are composed in great part of calcium carbonate; and probably some of the small calculi of this composition found in the bladder may have originally come from the prostate.

Carbonate of calcium is not an uncommon constituent of impure phosphatic calculi; but the quantity present is always small.

2044. A rounded, irregular calculus, measuring on section 4·2 cm. × 3·3 cm. It is of an earthy brown colour, and composed of a mass of coherent granules about the size of millet-seeds. The divided surface is radially fissured; the surface exceedingly rough and irregular. It is composed of carbonate of calcium mixed with a considerable quantity of animal matter. 3654

From the bladder of an ass.

Mixed Calculi.

Mixed calculi contain usually a nucleus, generally of renal origin, and composed of uric acid or oxalate of calcium, the former preponderating. Around the nucleus are deposited layers of different chemical composition, varying with the circumstances in which they were deposited. Thus, for example, a small uric-acid calculus may pass from the kidney to the bladder; here it may increase by the further deposit of uric acid perhaps mixed with urates. Then some change may occur in the patient's health or his diet, and as a consequence the deposit of uric acid may cease and be succeeded by oxalate of calcium. After a time, the stone causes irritation of the bladder, alkaline urine, and a consequent deposit of phosphates. If the acidity of the urine be restored, the phosphatic deposit may cease, and another of uric acid or oxalate of calcium may be deposited. An almost endless variation may thus result. The various laminæ have the colour and density described with the pure calculi. The most important varieties of mixed calculus are the following:—Uric-acid nucleus surrounded by oxalate of calcium (2045); a similar stone surrounded by phosphates (2046); uric-acid or urate nucleus surrounded by phosphates (2047, 2048); oxalate of calcium nucleus surrounded by uric acid (2049); oxalate of calcium nucleus surrounded by phosphates (2050); and mixed calculi without a definite nucleus (2051).

2045. Three calculi, the largest measuring 3 cm. in its greatest diameter, all very roughly nodulated on the surface. They are composed of oxalate of calcium surrounding pale uric acid. The largest stone has the smallest nucleus. In the smallest stone the deepest portion of the oxalate of calcium is so pale as to be scarcely distinguishable from the uric-acid nucleus. The section of the largest stone displays a single narrow zone of darkly coloured oxalate of calcium in its mid substance.

2046. A small rounded calculus, 2·5 cm. in diameter, and rough on the exterior surface. On section it presents three distinct zones:—1st. An oval nucleus the size of a large pea, fawn-coloured, and composed of uric acid; 2nd. A dark brown nodular zone composed of oxalate of calcium, the outer layers of which are darker than the inner; and 3rd. A zone about 3 mm. thick, white in colour, and partly crystalline in structure, composed of ammonio-magnesium phosphate and phosphate of calcium. 3435

It was successfully removed from a man, aged 23, by Mr. Liston.

2047. An oval calculus, measuring 5·5 cm. × 4 cm., formed of layers of different composition. The outer surface is rough. The nucleus, which is very small, is of uric acid, surrounded by layers of urate of ammonium, on which succeed laminæ of pale urate of ammonium, ammonio-magnesium phosphate, and phosphate of calcium; the outermost deposit is of fusible phosphates. 3392

2048. A large oval calculus, measuring 6 cm. × 5·2 cm. × 4·5 cm. Its external surface is white, and has a curious coarse crystalline appearance. The section shows a larger central part, composed of pale uric acid surrounded by alternating layers of urates and phosphates. One layer, about 3 mm. thick, apparently chiefly of phosphates, is marked by transverse lines of the colour of the urates. The outermost layer is of pure phosphates. 3520

2049. An oblong calculus (4·6 cm. × 3·6 cm.) with very irregular projections on the surface. The section shows it to be composed of a small rounded nucleus of a dark fawn-colour. This is enclosed within a long oval mass of paler colour and laminated structure. The laminæ are concentric with the nucleus and incomplete, as if part of a larger stone which had been broken up. Around this are oval laminæ of the same colour as the nucleus. Thus far the stone is composed of oxalate of calcium; the remainder, forming an irregular zone 12 mm. thick, of granular structure and without lamination, is composed of white uric acid. 3458

Removed by Mr. Liston.

2050. Half of a calculus, measuring 5·2 cm. × 3·3 cm. The nucleus is composed of oxalate of calcium, and is nearly circular in section. The fusible phosphate which partly surrounds it is deposited chiefly on opposite sides, giving an oval form to the stone. 2620

2051. A flattened circular calculus, 4 cm. in diameter, of a very coarse texture, without lamination, and rough on the surface. It is of a pale earthy-brown colour, and is composed of urates, phosphates, oxalate of calcium, and traces of sodium salts. 2774

BLADDERS UPON WHICH THE OPERATION OF LATERAL LITHOTOMY HAS BEEN PERFORMED.

2052. A bladder with the prostate gland, membranous portion of the urethra, and part of the penis, from a man who died of erysipelas after lateral lithotomy. A piece of wood has been passed from the urethra into the wound. In the operation the membranous portion of the urethra has been divided through its left side, and the lower part of the bulb deeply notched; externally the division of the prostate extends to a point about halfway between its apex and the vesiculæ seminales; internally the incision ceases about 1 cm. from the orifice of the left ureter. The surface of the wound is covered with a slough. The mucous membrane of the bladder appears to have been acutely inflamed (see No. 2053). 3719

From a man, aged 47, admitted into U. C. H., April 15, 1848, under Mr. Richard Quain, suffering from the ordinary symptoms of stone in the bladder; the symptoms had existed for four years. He died, after lithotomy, from "erysipelas and phlebitis." There was much difficulty in extracting the stone, firstly because it was seized in its long diameter, and, secondly, on account of its size.

2053. The calculus removed from the preceding case, partly broken during extraction.

2054. The bladder, prostate gland, and adjoining part of the urethra of a man on whom lateral lithotomy had been performed. The urethra has been opened in front of the membranous portion, the bulb being wounded for about 1 cm.: from this point an irregular wound extends backwards through the left lobe of the prostate (which is slightly enlarged) and into the base of the bladder nearly up to the orifice of the left ureter. The greater part of the wound in the prostate has been sewn up in preparing the specimen. The bladder is fasciculated and saccular. Above the orifice of the left ureter is a large sacculus which opens into the bladder by an almost circular orifice; it possesses no muscular coat. 798

The stone, which was removed from the bladder, is said to have been enclosed in a sacculus.

SPECIMENS ILLUSTRATING THE OPERATION OF LITHOTRITY.

If the calculus be hard the fragments resulting from crushing are sharp and angular; this is usually the case with calculi composed of dense uric acid or oxalate of calcium (2055). Failure to crush the stone on account of its hardness, as occurred in No. 2061, is very rare with modern instruments. Softer calculi, such as the phosphatic and less dense uric acid specimens, crush into a granular mass like broken-up dry mortar. If a fragment is left accidentally in the bladder it forms the nucleus of a new stone, the fresh deposit being composed almost invariably of mixed phosphates (2060). In No. 1955 the complete evacuation of the fragments was prevented by their becoming lodged in a sacculus.

At the present time the operation of lithotrity is performed at one sitting, under an anæsthetic, the stone being crushed into fragments sufficiently small to allow of their complete removal with an evacuator. Formerly the operation was performed at repeated sittings, the smaller fragments being left to be expelled spontaneously;

in such cases cystitis very frequently occurred and mixed phosphates were deposited on those parts of the stone which remained in the bladder (2058). Nos. 2062 & 2063 illustrate the old operation practised by Leroy and Civiale about the year 1823, in which attempts were made to break up the stone by drilling it with a specially constructed instrument introduced into the bladder through the urethra.

2055. The fragments resulting from the partial crushing of a stone composed of oxalate of calcium with a trace of uric acid (see No. 2056). 6467

2056. The remainder of the stone removed by suprapubic lithotomy from the same case as the preceding specimen. 6467

From a man, aged 25, who was under the care of Mr. Berkeley Hill in U. C. H. in 1888. There was a history of hæmaturia in childhood, and for two months before admission the patient had suffered from symptoms of stone in the bladder. The stone was seen with the cystoscope, and was grasped by a lithotrite in a diameter measuring $\frac{7}{8}$th inch; it was partly crushed, with great difficulty, and the remainder was removed a week later by suprapubic lithotomy. The patient did well, and left the hospital 5 weeks after the operation. (Surg. Reg. Rep. 1888, p. 186, No. 1790.)

2057. A bladder, with the prostate gland and part of the urethra. The left lobe of the prostate is enlarged more than the right, and behind the gland there lies an oval calculus about 2·5 cm. in its greatest diameter. At the bottom of the bottle are several fragments of a smaller calculus which was crushed by lithotrity. The mucous membrane is rough and covered with a yellowish exudation. The ureters are slightly dilated. The unequal enlargement of the lateral lobes of the prostate has led to considerable deviation of the urethra; the right lobe is deeply perforated by two false passages. 4811

From a man who died after lithotrity. The kidneys were diseased.

2058. Two calculi of nearly equal size, removed from the bladder after death, one of them having been partially crushed by a lithotrite. The crust has been broken off from about one half of the stone in large angular fragments, leaving the nucleus exposed but uninjured. Both stones are composed of uric acid, and the fragments are whitened by a deposit of phosphates formed during the cystitis which followed the operation. The uncrushed stone measures 3 cm. × 2·6 cm. 3655

From a man, admitted into U. C. H., Oct. 1846, for stone in the bladder. At the time of admission his urine was healthy. On Oct. 9 Mr. Liston crushed a stone with the screw lithotrite; after which the man suffered from painful swelling of the testicles, with fever and pain in the hypogastric and lumbar regions. He gradually sank and died on Oct. 23. After death the bladder and urethra were found to be inflamed. There was suppuration in the prostate and left testicle.

2059. A bladder with the prostate gland. The prostate is considerably enlarged; its middle lobe forms a pedunculated swelling which nearly conceals the trigone. The bladder is hypertrophied and contracted; its mucous membrane is thickened and roughened by chronic inflammation; the mucous membrane covering the middle lobe of the prostate is superficially ulcerated. The urethra is considerably deepened by the hypertrophy of the lateral lobes of the prostate. At the bottom of the bottle there are two small pyramidal calculi, each about 1·7 cm. in length. (See No. 2060.) 4576

2060. A section of a small calculus removed after death from the same case as the preceding specimen. The calculus is composed of ammonio-magnesium phosphate deposited in layers on a fragment of a urate of ammonium stone, which had been previously crushed. The fragment is crescentic in form and measures 9 mm. × 4 mm. 3463

From a patient operated on one year before death by Baron Heurteloup, by whom he was dismissed as cured. There were two other calculi of irregular triangular shape in the bladder besides those shown in the specimens. (Liston's 'Practical Surgery,' 4th edition, 1846, p. 504.)

2061. A long irregularly oval calculus measuring 5·7 cm. × 3·5 cm. Its surface is white, rough, and apparently composed of phosphates. The stone has been grasped twice in its transverse diameter by a lithotrite, and part of the crust broken off on each side. On one side a granular surface has been exposed like that of an oxalate of calcium stone. 3496

The man had symptoms of stone for five years. Some time before he was admitted into U. C. H., an attempt to crush the stone had been made at Westminster Hospital, after which he only passed a few fragments. He subsequently became much worse, and was admitted under Mr. Liston's care in April 1835. Lateral lithotomy was performed on May 2, and the patient was discharged May 21.

2062. A large uric acid calculus, thinly coated on the surface with phosphates. It measures 7·5 cm. × 5·5 cm. A part of it has been drilled away by means of Civiale's three-bladed drill lithotrite. The marks of the drill are chiefly shown by deep grooves on the sides; but one or two holes have also been bored into one end of the stone. Although it is evident that the stone must have been caught and drilled about twenty times, little impression has been made on it. The surfaces exposed by the drill are covered in most places by a thin layer of phosphates deposited after the operation. 1765

2063. A large, flat oval calculus, measuring 5 cm. × 4 cm. × 2 cm. It is composed of phosphates on the surface and urates in the centre. It is marked by twelve holes made by Civiale's three-bladed drill lithotrite, which was used on nine occasions. One drilling has completely perforated the stone. 3428

From a man, aged 62, under the care of Mr. Liston, who finally performed lithotomy in November 1827, at the patient's request. (Edin. Med. and Surg. Journal, No. 94, p. 222. The specimen is figured in Liston's 'Practical Surgery,' 4th edition, 1846, p. 496.)

INJURIES AND DISEASES OF THE URETHRA.

Rupture of the Urethra.

The urethra may be lacerated by any injury by which it is driven forcibly against the pubic arch, as by a kick in the perineum or a fall astride a beam. Such lacerations almost invariably occur in the membranous portion, but the lower bulbous portion may also be injured. In fracture of the pelvis the fragments may tear the membranous urethra. The urethra is far more commonly injured by the surgeon in the passage of instruments (see False Passages).

Foreign Bodies in the Urethra.

2064. A probe which was extracted from the urethra of a male subject. 796

2065. A sequestrum from the pubic bone, removed from a cavity which communicated with the urethra close to the neck of the bladder and opened into the perineum. The sequestrum is of an irregularly triangular form, measuring about 2 cm. 3466

At the age of 18 or 19 the patient had suffered from extensive suppuration over the pubic bone, with separation of sequestra. At the age of 26 an abscess formed in the perineum and caused retention of urine. The abscess burst, and a fistula remained which communicated with the urethra and with the rectum, two inches above the anus. The sphincter ani was divided, and in the operation the probe grated against a hard and rough body, supposed to be metallic. The wound was dilated, and the piece of bone extracted from a cavity which communicated with the urethra close to the neck of the bladder.

Calculi in the Urethra.

The impaction of a urinary calculus in the urethra is one of the commonest causes of retention of urine in male children, the calculus most commonly lodging either in the membranous portion or near the meatus. In the former position the stone may require removal by perineal incision, in the latter it can be extracted by forceps. Impaction of a stone in the urethra of an adult is less common; it may lodge in the prostatic urethra without obstructing the canal. In the latter case the stone may increase in size and by its presence form a sort of cyst in the prostate (2073). Calculi may also form in the dilated portion of the urethra behind a stricture, and may attain a considerable size, lying in a pouch projecting from one side of the urethra, so that the passage of urine is still possible (2074).

2066. A long oval calculus measuring 18 mm. × 7 mm. It is of a pale brown colour and rough on the surface. 3446

It was removed by Mr. Liston from the end of the urethra of a boy. It gave rise to retention of urine, for which he was brought to the hospital. He suffered also from a tight phimosis, so that it was necessary to slit up the prepuce before the stone could be removed.

2067. A small flattened oval calculus measuring 10 mm. × 9 mm. It is pale brown in colour, and slightly irregular on the surface. 3516

The patient was a boy aged 11, who had long suffered from difficulty and pain in passing water and pain across the hips. Six years before, a calculus lodged in the urethra, causing retention of urine; but the stone was pushed into the bladder by a catheter, and did not again appear till the day before his admission into U.C.H., June 30, 1842. On that day he was forced to retain his water longer than usual, and when at last he tried to pass it he found himself unable to do so. He came to the hospital the same day, and a stone could be felt impacted in the urethra, by the side of which the water dribbled. On the following day Mr. Quain, failing to extract it, pushed it back into the membranous part of the urethra and cut it out from the perineum. Pain and tenderness of the belly and suppression of urine supervened, and the lad died on July 7. The *post mortem* examination showed granular kidneys, dilatation of the ureters, and thickening of the bladder.

2068. The anterior portion of the penis of an adult, the urethra being laid open from below, to expose a smooth oval calculus which is impacted in it immediately behind the glans. The calculus is about 1·5 cm. in length by 1·2 cm. in its greatest breadth, and completely fills the urethra, which is expanded around it. The mucous membrane is superficially ulcerated. 2595

2069. An oval calculus composed of pale uric acid, surrounded by layers of phosphates alternating with uric acid. It is about the size of a horse-bean, and was removed from the urethra of an adult by incision in the perineum. 3414

2070. Two calculi of irregular form. The larger is flat and has been broken into two pieces. It contains a small brass curtain-ring 13 mm. in diameter. The stone is 2·5 cm. in its greatest diameter. The smaller stone is conical in form and 1 cm. from base to apex. It articulated by a smooth surface with the other.

The patient, then nearly 50, had, as he stated, when a boy pushed a small brass curtain-ring over the penis till stopped by the scrotum, in order to prevent the urine from passing off during the night. The swelling that ensued prevented its removal; he kept the occurrence secret; the tumefaction gradually abated, and the ring disappeared. But the hardened mass which remained increased in size; and latterly micturition had become difficult. The foreign body was cut upon and removed. On making a section of it, the greater part of the ring was found forming the nucleus, as here seen. The continuity of the erectile tissue, which had been thus cut through gradually by the foreign body, was perfectly re-established. (Liston's 'Practical Surgery,' 4th ed., 1846, p. 520.)

2071. The bladder and penis of a boy, who died from the impaction of a calculus in the urethra. The mucous membrane of the penile portion of the urethra is irregularly destroyed by ulceration, probably induced by injuries in the attempt to extract the calculus. The bladder and prostate gland are healthy. 810

2072. A bladder and penis with the adjoining part of the rectum. The bladder is hypertrophied and contracted; its mucous membrane is chronically inflamed; the ureters are dilated. The prostatic portion of the urethra is dilated into a thick-walled cavity about 3·5 cm. in diameter. The urethral orifice is of ordinary size. The prostatic urethra has been laid open on each side, to show two stones which lie within and completely fill it. These stones are finely granular on the surface and adapted one to the other, the upper having a smooth convex surface articulating with a corresponding concavity in the lower.

The penile portion of the urethra has been laid open from below; it is considerably narrowed at the bulb, in the roof of which is a laceration, produced probably by the use of instruments; beyond this the floor has apparently sloughed so as to give the urethra the appearance of being widely dilated. Between the membranous and prostatic portions of the urethra and the rectum is a dense mass of indurated inflammatory tissue, tunnelled by fistulous tracks, probably from the enlarged prostatic urethra; anteriorly one of the fistulæ opens into a large abscess which has been divided in preparing the specimen. There is, besides, a fistulous communication between the rectum and the prostatic portion of the urethra. 784

The patient was an old man who had been troubled with stricture for 10 years. He was suffering chiefly from stricture of the rectum when admitted into the hospital; he passed water freely through fistulæ in the perineum. The perineum afterwards sloughed, as it appeared, from extravasation of urine; he died exhausted. No instrument had been passed for a long while by the urethra. The left kidney was found, after death, soft and dark-coloured, its pelvis dilated, and the ureter thickened. The stricture of the rectum is preserved in the specimen.

2073. A bladder with the prostate gland and part of the penis. The bulbous portion of the urethra has been laid open through its floor, and the incision carried backwards through the left side of the membranous and prostatic parts. The left lobe of the prostate is hollowed out into a large cavity, in which lies an oval calculus about 1·5 cm. in length. The part of the calculus furthest removed from the urethra is nodular on the surface and of a dark brown colour; that facing the urethra is thickly coated with phosphates. The bladder is slightly hypertrophied; the ureters are dilated. 5370

From a man who was under the care of Mr. Marshall in U. C. H. Death occurred during the administration of chloroform. A sound passed after death grated against the calculus and then passed freely into the bladder.

2074. A diagram of the bladder, prostate and urethra, with numerous phosphatic calculi placed in the positions which they occupied. Several irregular stones lay in the bladder, two large irregular ones occupied the dilated prostatic urethra and two others, one of which is cylindrical and 4 cm. in length, lay in the bulbous portion of the urethra, between two strictures. 6412

From a man, aged 46, who was under the care of Dr. A. H. Robinson in the Mile End Infirmary in January 1886. He had gonorrhœa 20 years previously. He was admitted for incontinence of urine and hæmaturia. On attempting to pass a sound a calculus was felt in the urethra; on rectal examination a round, hard mass was felt in the position of the prostate. On Jan. 24, 1886, Mr. Godlee opened the membranous urethra and with forceps extracted the calculi from the prostatic urethra and from the bladder. A stricture in the bulbous portion of the urethra was divided and the stones in front of it extracted. the anterior stricture being finally dilated with straight bougies. The patient did well. (Clin. Soc. Trans. vol. xix, 1886, p. 319.)

STRICTURE OF THE URETHRA.

Stricture of the urethra results from cicatricial contraction or fibrous induration of the wall of the canal. The two most important causes are injury and chronic urethritis, almost invariably of gonorrhœal origin, of which the latter is by far the more common. The occurrence of stricture after gonorrhœa is dependent upon the persistence of the urethritis, which frequently causes a granular condition of the mucous membrane, especially in the bulbous portion, followed by thickening and induration of the mucous membrane and submucous tissue. Unless the injury has been so severe as to cause an evident cicatrix to be present around the urethra, traumatic strictures are difficult to recognise from gonorrhœal. They are usually somewhat limited in extent, excessively tight and unyielding, and more commonly situated in the membranous portion. In fact the great majority of strictures affecting the membranous portion are of traumatic origin. Old gonorrhœal strictures, such as are usually found in museums, are frequently as dense and cicatricial in appearance as those of traumatic origin, and may be as limited in extent. A stricture extending over a considerable part of the canal and multiple strictures are almost certainly of gonorrhœal origin (2083). Strictures are also divided according to their extent and form, as annular (2075), diffuse, nodular, &c. A stricture is best exhibited by laying the penis open along its dorsal aspect, and continuing the incision onwards through the upper surface of the prostatic urethra and the anterior wall of the bladder. The points to be observed are :—

I. *The Seat of the Stricture.*—This is recognised by the narrowing of the canal at the strictured point. The majority of strictures, about 70 per cent., are situated in the posterior bulbous and the immediately contiguous part of the membranous urethra (2075). The next most common seat is within one inch of the orifice or at the orifice. Strictures limited to the membranous part are usually of traumatic origin. Strictures never occur in the prostatic urethra.

II. *The Number of Strictures.*—Strictures are frequently multiple when of gonorrhœal origin. Traumatic strictures are usually single.

III. *The Urethra in front of the Stricture.*—This presents the unaltered appearance of the normal urethra. In the fresh state it is of a uniform dark pink colour, smooth, and without wrinkles or folds. In spirit-specimens it is white, but with a certain degree of transparency. It may be wrinkled longitudinally if it has been immersed in too strong spirit. Scattered over its surface are the small openings of the mucous glands. Immediately beneath it is the spongy tissue of the corpus spongiosum, the spaces of which can readily be recognised.

IV. *The Stricture.*—The surface of the mucous membrane at the seat of stricture is opaque white and parchment-like in appearance. It has lost its natural smoothness, and the glandular orifices can no longer be recognised. The opacity and thickening are sometimes arranged in large patches, sometimes in streaks with hollows between, and sometimes in irregular spots. The mucous membrane is often thrown into longitudinal folds, from shrinking of the surrounding fibrous tissue.

The mucous membrane and submucous tissue are seen, at the cut edge, to be increased in thickness, and the spongy tissue of the corpus spongiosum is usually consolidated, so that it appears uniform in structure with the thickened submucous tissue (2075). The extent over which these changes have taken place varies greatly. It is, as a rule, least in traumatic strictures. When limited to a very small area and forming a ridge only on one side, it forms the so-called " bridle stricture." This is frequently perforated in the passage of instruments, and thus a free band may exist across the urethra. When forming a distinct ring around the urethra, the stricture is called " annular." When the strictures are multiple the most posterior one is almost invariably the narrowest, and, consequently, the mucous membrane between it and the anterior, not being exposed to tension during micturition, may be healthy.

The chronic inflammatory induration which causes the stricture is, in many cases, not limited merely to the submucous tissue and the spongy tissue of the urethra, but may extend widely into the neighbouring part of the perineum and scrotum.

V. *The Urethra behind the Stricture.*—If the stricture is very narrow the urethra behind it, having been exposed to considerable strain during micturition, is usually found to be greatly altered in appearance. It is more or less dilated, and its mucous membrane is thrown into longitudinal folds, indicating not only its stretched condition, but a loss of elasticity from chronic inflammation. In the fresh state it is redder than natural, and in museum specimens, in which the red colour has disappeared, the dark grey pigmentation indicative of prolonged congestion is often clearly seen. The surface of the mucous membrane has lost its natural smoothness; it is deeply pitted by the dilatation of the orifices of the ducts of the glands (2075), and sometimes it is superficially ulcerated. The changes are usually less marked in the prostatic portion of the urethra; but here also there is often marked dilatation with pigmentation of the mucous membrane and enlargement of the orifices of the prostatic ducts (2077).

VI. *The Bladder* is invariably more or less hypertrophied according to the degree of obstruction to the passage of urine. It is most frequently contracted, but occasionally there is dilatation with hypertrophy. It is often sacculated. Its mucous membrane presents all the appearances of chronic cystitis before described.

2075. Part of a penis and prostate, the urethra having been laid open from below, to display a stricture situated at the junction of the membranous and bulbous portions; opposite the stricture the floor of the urethra has been left uncut. The submucous tissue is thickened and indurated. The stricture is annular and greatly narrows the canal. The mucous membrane on each side of the stricture is marked by longitudinal folds. The urethra in front of the stricture is normal. The membranous part of the urethra behind the stricture is slightly dilated and the orifices of its mucous glands distended. 780

2076. A bladder with the prostate gland and urethra. The urethra has been laid open to display a narrow annular stricture through which a bristle has been passed between the bulbous and membranous portions. The mucous membrane in front is smooth and healthy; that behind is opaque, longitudinally wrinkled, and thickened. The submucous tissue of the stricture is dense and thickened.

The bladder is dilated and a little hypertrophied; its mucous membrane is opaque from chronic inflammation. 2183

2077. A bladder, prostate and urethra laid open to display a stricture which involves the membranous and adjacent part of the bulbous portions of the urethra. In the strictured portion the wall of the urethra and the tissues around it are thickened and indurated. The prostatic urethra is dilated, and in its floor on the right of the verumontanum are seen the enlarged orifices of mucous glands. The urethra in front of the stricture is normal. The bladder is not hypertrophied; the mucous membrane is thickened and opaque; there is a small sacculus on the left side. 6935

2078. A bladder, with the prostate gland, the greater part of the penis, and a portion of the rectum. The bladder and urethra have been laid open to display a stricture of the urethra, situated about 2·5 cm. in front of the junction of the bulbous and membranous portions. The submucous tissue at the site of the stricture is thickened and indurated; the bulbous portion of the urethra is dilated and reddish brown from chronic inflammation; the membranous portion appears healthy. The bladder is hypertrophied; there is no dilatation of the ureters. The bladder has been tapped from the rectum immediately behind the prostate, the rectum being perforated about 4 cm. from the anus: the puncture is about 3·5 cm. below the reflexion of the peritoneum. 4575

From a man, aged 32, who was admitted into U. C. H. Nov. 20, 1859, under the care of Sir J. Erichsen. He had suffered from stricture for eight years. As no instrument could be passed under chloroform, the bladder was punctured from the rectum, and two pints of highly-coloured urine were drawn off. The patient did well until the 25th, when the canula was withdrawn. In the afternoon of the next day slight delirium came on, and was followed by "typhoid" symptoms: he passed a very restless night and died at noon on the 27th. Gas, having a strongly fæculent odour, was found effused through the subcutaneous tissue of both thighs and flanks, and also from the right shoulder to the wrist. During life these parts were emphysematous. (See 'Lancet,' Jan. 28, 1860.)

COMPLICATIONS OF STRICTURE OF THE URETHRA.

(a) *Perineal Abscess and Urinary Fistula.*

A *perineal abscess* may form by suppuration taking place in one of the mucous glands, or by the formation of pus in the submucous tissue, or by ulceration or wound of the urethra behind the stricture and localised extravasation of urine. In whichever way the abscess forms it is always surrounded by a dense mass of indurated tissue, so that its progress is comparatively slow. Such an abscess may burst into the urethra, and if the stricture be not very narrow, the cavity of the abscess may close without giving further trouble. If, however, the obstruction of the passage of urine be considerable, the cavity will be distended tensely with urine during each act of micturition. In these circumstances it continues slowly to increase in size, and advances towards the surface, finally bursting or being opened, most commonly in the perineum behind the scrotum. After it is opened the cavity contracts to a narrow channel, through which urine flows during micturition, and thus a *urinary fistula* is established. The channel thus formed is, in most cases, tortuous and narrow, and offers considerable resistance to the passage of urine, and consequently pouches are formed from it which burrow in various directions, and may open on the surface in many places, in the perineum, scrotum, or even on the thighs. However numerous the superficial openings may be, they usually communicate with a single aperture in the urethra. In all cases the burrowing takes place in a forward direction towards the surface, any burrowing backwards being prevented by the triangular ligament and the fasciæ surrounding the prostate. The tissues surrounding the fistulous tracts become thickened and indurated by chronic inflammation, until a mass may be formed involving the whole scrotum and perineum (2084). Urinary fistulæ are the natural provision for the escape of urine in very bad strictures. They are incurable as long as the obstruction exists in the natural passage; as soon as the obstruction is removed they heal without difficulty.

The perineal abscesses and fistulæ above described arise almost invariably from the membranous portion of the urethra. Abscesses in connexion with the spongy portions more often occur as the result of treatment. The tissues may slough at the point of stricture in cases in which a catheter has been tied in for any length of time, or in the passage of the catheter or in the performance of internal urethrotomy the corpus spongiosum may be completely penetrated so as to open up the loose tissue beneath the bulbo-cavernosus muscle. In such cases a limited extravasation of urine may occur with the formation of an acute abscess, which burrows forwards beneath the bulbo-cavernosus and the tendinous expansion from that muscle, and points at the root of the penis. Posteriorly, it surrounds the bulb. It is important to recognise this condition, and to distinguish it from general extravasation of urine, so as to avoid the error of making merely superficial incisions in the scrotum for its relief (2079).

2079. A bladder with the prostate gland and penis. The urethra has been laid open from the upper aspect.

There is a slight stricture of the membranous portion of the urethra, immediately in front of which a piece of bougie has been passed from the upper and left side of the urethra along a false passage made by the use of instruments, and which leads apparently into the cavity of an extensive, irregular abscess in the perineum. The abscess seems to have burrowed forwards beneath the expansion from the bulbo-cavernosus over the bulb and corpus spongiosum to within about 3 cm. of the glans penis. The tissues around the course of the abscess are thickened and indurated. On the dorsum of the penis is a small cavity, marked by a piece of whalebone, probably an extension of the larger abscess below. The bladder is contracted and hypertrophied; immediately in front of the orifice of the right ureter is a narrow, transversely elongated, ulcerated pit, which extends deeply into the submucous tissue.

The vesiculæ seminales and ends of the vasa deferentia are deeply imbedded in a mass of adipose tissue, which, on the right side, has a smooth surface covered with exudation, and has apparently formed part of the wall of an abscess in this situation. The parts around the prostatic and membranous divisions of the urethra are hard and thickened, and on the right side appear to have been irregularly traversed by an abscess. 468

2080. A bladder with the prostate, penis, and part of the pubic bone, the urethra being laid open from the left side.

About 8·5 cm. from the external meatus there is a stricture of the urethra, capable of admitting a No. 3 English catheter. From the point to which the bulbous portion has been laid open to the membranous urethra, the canal is represented merely by a narrow track, through which a bristle has been passed. By the left side of the lower part of the bulb is an irregular abscess, which in the recent state did not communicate with the urethra, though it has been made to do so in preparing the specimen. Between the prostate gland and the rectum is the cavity of a second abscess. The bladder is hypertrophied. 782

The patient had long suffered from stricture, and his health became greatly impaired. Shortly before his admission an instrument was passed, after which his sufferings became greatly exaggerated. Two abscesses in the perineum were opened, and pus alone escaped from them. The patient died a few days afterwards. No communication was discoverable, on careful dissection, between the abscesses and the urethra.

2081. Part of a bladder with the prostate gland and penis. The urethra has been laid open as far as the membranous portion, from below, and for the rest of its extent through the roof. In the bulbous portion there is a stricture of the urethra, at which the canal has not been laid open. In the floor of the urethra, at the union of its bulbous and membranous parts, is an ulcerated aperture which leads into a perineal abscess; the mucous membrane from this point forwards, as far as the stricture, has in part been removed, probably in preparing the specimen. The membranous division of the urethra is slightly dilated. In the anterior part of the prostate, in front and on the right side, there is a small abscess. The bladder is hypertrophied. 4109

2082. A bladder with the prostate gland and part of the penis, the urethra being divided from above. The mucous membrane of the penile portion of the urethra is rough and swollen; a short distance behind the junction of the membranous and bulbous divisions, the continuity of the mucous membrane is quite destroyed by ulceration, probably at the seat of a stricture. The adjoining portions of the membranous and bulbous divisions of the urethra are dilated into a large ragged cavity, from which proceed two wide, diverging, fistulous tracks, marked by pieces of glass rod; the fistulæ diminish considerably as they approach the perineum.

The floor of the prostatic, and adjoining part of the membranous urethra, is deeply pitted from the misuse of instruments.

The bladder is dilated and hypertrophied and fasciculated; its mucous membrane is rough, blood-stained, and thinly covered with membranous exudation. The ureters are dilated as far as their passage through the wall of the bladder. The submucous tissue of the bladder is dense and thickened, and similar fibroid tissue lies between the hypertrophied muscular fasciculi. 800

2083. A dilated and hypertrophied bladder, with the prostate gland, penis, and adjacent parts. The urethra has been laid open through the left side in the prostatic and membranous portions, and in the rest of its extent through its floor. Near the lower end of the bulbous portion the urethra is closely strictured for about 1 cm. and surrounded by dense cicatricial tissue; the wall of the stricture is very uneven and deeply furrowed, probably from the use of instruments.

The membranous portion of the urethra is considerably dilated behind the stricture, and is perforated by two ulcerated apertures in its floor, which lead into a fistulous track which passes downwards and forwards, and opens in the perineum.

About 6 cm. from the meatus are two other strictures. The anterior of these is not more than 5 mm. in length; the surrounding corpus spongiosum is white, firm, and fibrous, like the tissue of a cicatrix, but the mucous membrane is clearly traceable upon it. There is a large lacuna magna. The bladder is hypertrophied and dilated. 1228

The preparation was obtained from an old man who had long suffered from stricture and perineal fistulæ.

2084. A bladder with the penis, scrotum, and part of the perineum, from a patient who suffered from stricture. The scrotum is deeply cleft; in the bottom of the cleft is a large fistulous track leading to the urethra, along which a piece of whalebone has been passed; on each side and in front of this are the openings of two other fistulæ. A fourth opening is situated on the dorsum of the penis, near the pubes. The subcutaneous tissue of the penis is considerably thickened. The bladder is contracted and hypertrophied; its mucous membrane is thickened from chronic inflammation. 2095

The condition has doubtless resulted from extravasation of urine leading to extensive sloughing and diffuse inflammation, from the immediate effect of which the patient recovered: the induration and thickening of the parts, together with the fistulous openings, have persisted.

(b) *False Passages.*

When an instrument is forced through the wall of the canal into the surrounding tissues, the track so formed is called a "false passage." A false passage is occasionally made in a healthy urethra. It is then most commonly due to the point of the instrument catching in the sinus of the bulb. It occurs most easily in the floor of the urethra, as the tissues on that side are more yielding and less supported externally. A false passage made in the treatment of stricture most commonly leaves the canal immediately in front of the constriction (2079). If the stricture be of short extent and the urethra behind is dilated, the instrument frequently enters the canal again behind the constriction. This accident is often spoken of as "tunnelling the stricture," and is doubtless of very frequent occurrence. In strictures near the bulb the instrument most commonly leaves the canal by the floor and finds its way into the areolar tissue between the rectum and prostate, or, occasionally, even into the gut. By depressing the instrument too soon and too forcibly, it may be made to leave the canal through the roof; but this is more difficult because of the greater resistance of the parts. In such cases the instrument tends to reenter the canal or to find its way, by one side of it, into the tissue between the rectum and the prostate. Only a very sharply curved, short-beaked instrument, such as a sound, can be forced into the tissues between the pubes and bladder. False passages may also start from behind the stricture from an instrument catching in the irregularities of the mucous membrane in the dilated part of the urethra (2085). In enlargement of the prostate false passages are very common in consequence of the irregularity of the canal, and especially the projection of the middle lobe from the floor.

False passages most frequently heal without difficulty; but occasionally suppuration is set up along their track, leading to the formation of abscesses around the urethra.

2085. The lower part of a bladder with the prostate gland and part of the penis, the urethra being laid open from above. The prostate has been deeply tunnelled in various directions by instruments. The prostatic substance around the false passages is indurated from inflammation, and abscesses of considerable size have formed in each lobe.

There has probably been a stricture in the bulbous portion of the urethra.

The mucous membrane around the opening of the right ureter, and on the right side of the aperture of the urethra, is beset with clusters of closely set villi, which are, in places, coated with phosphatic deposit.

The right ureter is dilated from the resulting obstruction; the left is of normal size.

(c) *Extravasation of Urine.*

In the gradual formation of a perineal abscess and urinary fistula, although urine is forced into the abscess cavity during the act of passing water, the surrounding tissues being indurated by the chronic inflammation are in most cases sufficiently dense to prevent its escaping into the areolar tissue. Occasionally, however, the wall of the abscess is torn by the distending force, and extravasation of urine takes place. In other cases extravasation may occur from rupture of the urethra in the dilated part behind the stricture, without the previous formation of an abscess-cavity. Extravasation of urine may also occur in a case of stricture from a wound made in the treatment of the disease, either in the passage of instruments or in cutting-operations. In extravasation of urine the fluid is shut off from the anal region by the attachment of the deep layer of the superficial fascia to the triangular ligament. It consequently distends the areolar tissue of the scrotum and penis, and then passes upwards into the groin and the lower part of the abdomen. Wherever it spreads it causes inflammation and sloughing (2086).

2086. A bladder with the prostate gland and penis. The urethra has been laid open for the greater part of its length through the floor, and posteriorly through its left side.

The urethra in front of the membranous portion is considerably narrowed by a stricture, and its mucous membrane has, at this point, been in great part destroyed by ulceration; elsewhere it is smooth, white, and firm. At the front of the stricture the ulceration has spread through the right side of the corpus spongiosum, and through this opening extravasation of urine appears to have taken place, the skin of the penis being extensively separated by sloughing from the subjacent parts; on the prepuce the skin for about a third of the circumference has been destroyed; behind this it is perforated by the separation of a slough.

The bladder is hypertrophied and fasciculated. Beneath the peritoneum on its posterior surface on the right side and near the apex is an irregular cavity, probably an ulcerated sacculus, which opens into the bladder and the peritoneal cavity; there is no exudation on the peritoneum. 3641

The patient had had difficulty in micturition for some time; about a fortnight before his admission into U. C. H., May 1, 1845, swelling of the scrotum followed straining during micturition. At the time of admission the swelling extended over the perineum, scrotum, and penis, and lower part of the abdomen; some urine passed by the urethra. After treatment by incisions the patient went on well till June 17, when peritonitis suddenly set in, and he died in 48 hours. ('Lancet,' vol. i, 1846.)

2087. A bladder with the prostate gland and penis, the urethra being laid open through its roof. The urethra is strictured at two points, one 4 cm. from the external meatus, the other in the anterior part of the membranous division. Between the two strictures and behind the posterior the urethra is widely dilated. The mucous membrane throughout the urethra is soft, swollen, and, in places, superficially ulcerated. In the posterior stricture the mucous membrane appears to have been destroyed, in part, by ulceration, which has spread for a short distance into the surrounding structures. Several deep pits, some ulcerated, and perhaps greatly dilated ducts, open into the prostatic portion of the urethra. About 3 cm. behind the anterior stricture, in the floor of the urethra, is an oval ulcerated opening, 1 cm. in length, which leads into an abscess around the corpus spongiosum. The bladder is much hypertrophied; its mucous membrane is opaque and thickened from chronic inflammation. 1617

The patient, aged 80, had long suffered from stricture of the urethra. Retention of urine supervened, followed by extensive extravasation of urine. The swelling thus formed in the perineum was opened, but the patient died of exhaustion.

TUMOURS OF URETHRA.

Tumours of the male urethra are extremely rare. Carcinoma not uncommonly invades the canal from the bladder, prostate, or penis. Primary squamous carcinoma of the urethra is occasionally met with.

INJURIES AND DISEASES OF THE TESTICLE AND SPERMATIC CORD.

INJURIES OF THE TESTICLE.

2088. The testicles and part of the scrotum of a man who performed self-castration during an attack of religious excitement. 7236

The hæmorrhage was slight, and the wound quickly healed.

MALPOSITION OF THE TESTICLE.

(*See* CONGENITAL MALFORMATIONS.)

INFLAMMATION OF THE TUNICA VAGINALIS.

Inflammation of the tunica vaginalis most commonly occurs as a consequence of gonorrhœal epididymitis. The sac is then distended by serous exudation forming the so-called "*acute hydrocele.*" Fibrinous exudation may also be present, forming a more or less perfect layer on the surface of the serous membrane. When the fluid has been absorbed, adhesions may take place between the opposed surfaces.

Inflammation and suppuration of the tunica vaginalis may occasionally occur as the result of the treatment of hydrocele by tapping or injection (2089).

2089. A testicle with its coverings, removed by operation and divided antero-posteriorly. The testicle is healthy. The tunica vaginalis is represented by a cavity 5 cm. in diameter, the wall of which is much thickened and the inner surface corrugated and partly covered with a layer of inflammatory exudation. 5642

From a man, aged 38, who was admitted into U. C. H., under the care of Mr. Heath, in 1881. Ten years previously a hydrocele had been tapped, and two months before admission the tapping was repeated and the sac injected with iodine. On admission the right testicle was enlarged, hard, smooth, and free from tenderness; there was no testicular sensation; the scrotum was adherent and somewhat œdematous and contained two sinuses. The enlargement of the testicle resembled a tumour. The tunica vaginalis contained thin purulent fluid. (Surg. Reg. Rep. 1881, p. 38.)

HYDROCELE.

The term hydrocele is applied to any localised collection of fluid in the immediate neighbourhood of the testicle, and for convenience the specimens of the different varieties are included in the same series.

The most important varieties of hydrocele are: (1) Hydrocele of the tunica vaginalis (simple or vaginal hydrocele); (2) Encysted hydrocele of the epididymis; and (3) Encysted hydrocele of the spermatic cord.

1. *Hydrocele of the Tunica Vaginalis.*—This may be primary, or secondary when it occurs in consequence of some disease of the testis. In a simple hydrocele

the effusion takes place without any of the manifestations of inflammation. The fluid is clear, of a pale straw-colour, and not spontaneously coagulable. It contains no flakes, nor is there any solid exudation on the serous surface. As the fluid increases, the swelling assumes the normal form of the distended tunica vaginalis; it is pyriform, the smaller end being directed upwards (2092). The testicle is completely concealed by the swelling; it is commonly situated at the posterior part, a little below the middle (2091). In the early stages of the disease the serous membrane is not materially altered in appearance; it remains thin and translucent (2090), and is smooth on the surface. In very old and large hydroceles the wall often becomes much thickened, sometimes to such an extent as to render it opaque (2097). The cause of a primary hydrocele is very uncertain. It is most common in infancy and after middle life. Hydrocele is not uncommonly met with in conjunction with an inguinal hernia of the same side (2097). The following modifications of vaginal hydrocele are met with:—(*a*) Multilocular Hydrocele: In this the fluid is contained in two or more sacs, either completely separate or communicating by a narrow opening. This condition may be caused by the presence of adhesions formed during some previous inflammation. (*b*) Congenital Hydrocele: In this the processus vaginalis is not completely closed, and by steady pressure the fluid can be pressed back into the abdomen. (*c*) Infantile Hydrocele: In this the processus vaginalis is closed at the abdominal opening, but patent along the cord (2098). The hydrocele will thus extend along the cord to the external ring, or sometimes into the inguinal canal. It then closely resembles a hernia, having a transmitted impulse on coughing, but may be distinguished by its irreducibility and translucency.

A secondary hydrocele almost invariably accompanies syphilitic disease of the testicle (2133); it is not uncommon in tuberculous testis (2124), but is? rare in malignant disease of the gland.

2. *Encysted Hydrocele of the Epididymis.*—In this form of hydrocele the fluid is contained in a cyst altogether distinct from the tunica vaginalis, and intimately connected with the epididymis, usually at its upper part. The cyst thus lies above the body of the testicle and, as it increases in size, extends downwards behind it (2100). An encysted hydrocele of the epididymis rarely reaches a large size; it is met with only in adults; its wall is thin and the cyst is usually single, but in rare cases multilocular (2103). The fluid may be clear, but is usually opalescent or milky from the presence of spermatozoa.

The exact mode of origin of encysted hydrocele of the epididymis is doubtful. Possibly the cyst arises in connection with the coni vasculosi or one of the vestigial structures found in the neighbourhood of the epididymis, such as the vas aberrans and organ of Giraldés.

3. *Encysted Hydrocele of the Spermatic Cord.*—This form of hydrocele results from distension with fluid of an unobliterated portion of the processus vaginalis. It forms an oval swelling in front of the cord, and has no communication with the peritoneum above or the tunica vaginalis below (2104). It is most common in early life. This form of hydrocele may closely resemble a hernia, but can be distinguished by its translucency and by the fact that it can be drawn down by traction on the testicle after it has been pushed up into the inguinal canal. An encysted hydrocele of the cord is occasionally of acute onset, and may simulate a strangulated hernia.

2090. A testicle with the tunica vaginalis dried. The tunica vaginalis has been distended into a small hydrocele. The sac is thin and translucent, except at the part below and behind where the testicle is lying. Above this the course of the cord can be recognised by the diminished translucency.

2091. A testicle with its coverings and a part of the spermatic cord. The tunica vaginalis, which has been distended into a hydrocele, is laid open along its anterior aspect. The body of the testicle projects into the interior of the sac, and the outline of the globus major of the epididymis can be seen curving above its upper border. The tunica vaginalis is slightly thicker than natural, and its surface, both in the visceral and parietal part, is wrinkled and opaque. The cord has been dissected to show some dilated and tortuous spermatic veins just above and behind the sac. The testicle itself is healthy. 4100

From an old man who died of cholera.

2092. A testicle with its coverings and a small portion of the spermatic cord. The tunica vaginalis has been distended by fluid, so as to form a hydrocele. It has been laid open along one side.

The sac is 8 cm. in its longest diameter. The upper end is narrower than the lower, giving it a pyriform shape. The testicle is lying below and behind. It is placed slightly transversely, and the body projects into the sac. The inner surface of the tunica vaginalis is smooth. Anteriorly the coverings have been completely dissected off, showing the tunica vaginalis to be thin and translucent. Posteriorly tho cremasteric fascia has been only partly removed. 760

2093. A testicle with the tunica vaginalis, and part of the cord, showing a large hydrocele measuring 12 cm. vertically by about 8 cm. transversely. The sac is composed of the tunica vaginalis with the cremasteric fascia firmly adherent to it; at the upper part they have been separated for a short distance by dissection. The testicle projects into the lower part of the sac; it is slightly flattened by the pressure of the fluid. The cord is healthy. 4804

2094. A testicle with its coverings; the tunica vaginalis has been distended so as to form a hydrocele of almost globular form. The sac of the hydrocele and its coverings are adherent, but have been partly separated by dissection. The tunica vaginalis has been laid open from one side; it is considerably thickened, being composed of several layers of dense fibrous tissue. The serous surface of the tunica vaginalis is opaque. The position of the testicle is marked by a slight rounded projection, nearly opposite the opening into the sac of the hydrocele. On the surface of the sac are some veins of considerable size. A bristle has been passed into the vas deferens at the upper part of the specimen. The position of the other constituents of the cord cannot be recognised. 2049

2095. A testicle with the tunica vaginalis dried, showing a vaginal hydrocele. The testicle lies at the posterior and lower part of the sac, and projects into it. The general form of the sac is pyriform, but a pouch projects forwards in front, and is separated from the main cavity of the hydrocele by a falciform fold half surrounding the aperture of communication. The vas deferens has been injected with mercury. 762

2096. A testicle with its coverings and part of the spermatic cord. The tunica vaginalis has been the seat of a hydrocele. Its cavity has been laid open along its anterior aspect; it is incompletely divided by a deep fold arising from the border of the testicle, and terminating above in a falciform edge. Behind this fold is a second smaller one, probably connected with the epididymis. 3989

2097. The sac and coverings of a right external inguinal hernia, together with the part of the abdominal wall, including the abdominal rings, and the sac of a very large hydrocele of the tunica vaginalis. The sac of the hernia has descended into the scrotum, and its fundus is spread out on the upper part of the hydrocele, with which it appears to be continuous, as the thickened coverings common to it and the hydrocele have not been dissected off. The contents of the hernial sac have been removed, and a hole has been cut in its anterior wall. The fundus can be seen through the aperture to be rendered convex internally by the sac of the hydrocele below.

The hydrocele is nearly globular in form, and measures about 12 cm. in diameter. A hole which has been cut in its anterior aspect shows that the tunica vaginalis and its coverings are inseparably blended and much thickened. The wall is laminated, and its inner aspect roughened by a flocculent brownish deposit, apparently old coagulated blood. 761

There has evidently been hæmorrhage in the sac, but not sufficient in quantity to form a hæmatocele. The sac during life would have been quite opaque.

2098. A testicle and part of the spermatic cord, together with the sac of a hydrocele and the lower extremity of a small hernial sac. The sac of the hydrocele is elongated, measuring 9 cm. in length and 3 cm. transversely; it extends upwards in front of the spermatic cord, and at its upper extremity is only separated by a thin septum from the lowest part of the hernial sac. 4839

The unusual shape of the hydrocele results from the fact that only the upper part of the processus vaginalis has been obliterated. The specimen is an example of the so-called "infantile hydrocele."

2099. The sac of an old hydrocele, together with the lowest part of a hernial sac which is connected with its upper extremity. The sac has been opened to display the density and thickness of its wall; in one situation the cut edge of the wall presents a deposit of calcareous matter between the fibrous layers of which it is composed. The inner surface of the sac is covered with an irregular layer of brown fibrinous material, evidently resulting from previous hæmorrhages into it. The testicle projects into the lower part of the sac. 8525

The hydrocele had existed for many years.

2100. A testicle with an encysted hydrocele of the epididymis. The tunica vaginalis, which is normal, has been laid open and reflected. The hydrocele forms an ovoidal cyst, 4 cm. in length; it lies in front of the lower part of the cord, and its lower extremity is in contact with the hilum of the testis. The epididymis is incorporated with the anterior wall of the cyst near its lower extremity, having been pushed forward from its natural position. A small hydatid of Morgagni is attached to the globus major. 210

2101. A testicle with the tunica vaginalis laid open and in great part cut away. At the upper part of the epididymis is a small cyst, which is situated above and behind the globus major; its walls are thin and translucent. Two hydatids of Morgagni are attached to the globus major; the larger has the size of a small pea and a slender pedicle. 10 A

2102. A testicle with its coverings. The tunica vaginalis has been partly removed so as to expose the body of the testicle and part of the epididymis that lies in the cavity. Situated at the back of the upper part of the gland, in connection with the epididymis, is a cyst of oval form. The consituents of the cord pass for some distance behind the cyst and in contact with its wall.

2103. A testicle with the spermatic cord. Extending from the testicle for 7 cm. up the cord is a multilocular cyst. It is has been distended with air, and, after drying, one side has been cut away to show the separate cysts. The spermatic artery has been injected. From the direction taken by the chief injected artery, and from the smooth rounded border to the testicle below, it is evident that the cysts have arisen from the back of the testis, probably in connection with the epididymis. The surface of the hydrocele is lobulated; the separate cysts of which it is composed are about ten or a dozen in number; they are irregular in form and size and are apparently completely separated one from another by delicate membranous septa. 2690

2104. An encysted hydrocele of the spermatic cord. The cyst is ovoidal and 4 cm. in length; the wall is thin; at its upper smaller end is seen the closed lower extremity of a pouch of peritoneum, which extended down into the pedicle of the cyst. 6622

From a boy, aged 8 years, who was under the care of Mr. Bilton Pollard in U. C. H. in 1889. A swelling was noticed above the right testicle at the age of 5 years; it gradually disappeared, but had recently returned. The cyst lay in front of the spermatic cord, and its upper end reached the external abdominal ring. It was excised. (Surg. Reg. Rep. 1889, p. 93.)

2105. An encysted hydrocele of the spermatic cord. The cyst is translucent and oval in shape; it measures 3 cm. in its longest diameter. Attached to the cyst is a fibrous cord nearly 2 cm. in length, which probably represents part of the obliterated funicular process above the part which became distended into the cyst. 9512

The cyst was removed by operation.

2106. An encysted hydrocele of the spermatic cord. It forms a closed, ovoidal cyst, 4·5 cm. in length. 8899

The cyst was excised.

2107. A left testicle and spermatic cord, together with an encysted hydrocele of the latter and part of a hernial sac. The hydrocele forms a rounded cyst, about 4 cm. in diameter, which lies in front of the cord, its lower extremity being separated by a finger's breadth from the upper end of the epididymis. The fundus of the hernial sac is intimately connected with the upper part of the encysted hydrocele, and in its present condition is rendered convex internally by the projection of the hydrocele into it. 7528

There is no history to the specimen. The upper part of the processus vaginalis remains as the hernial sac, and a lower portion, closed above and below, has become distended into the encysted hydrocele.

2108. A rounded cyst, measuring about 5 cm. in diameter.

The cyst was removed from the inguinal canal by Mr. Arnott. It is probably an encysted hydrocele of the spermatic cord.

2109. A testicle and part of the spermatic cord showing two hydroceles—a hydrocele of the tunica vaginalis and an encysted hydrocele of the cord. The former is small; the latter forms an oval cyst, 5·5 cm. in length, lying in front of the cord and separated below from the upper part of the tunica vaginalis by a thin septum. 7191

From a man who died from an accident.

HÆMATOCELE.

The name Hæmatocele is applied to any localised extravasation of blood in the immediate neighbourhood of the testicle, the most important variety being that in which the extravasation occurs into the tunica vaginalis.

Hæmatocele of the tunica vaginalis is most commonly the result of injury, but it may arise without evident cause. Sometimes it is preceded by a hydrocele, the hæmorrhage taking place into the already distended tunica vaginalis (2113). The extravasated blood becomes partly coagulated, sometimes forming layers of clot upon the inner surface of the serous membrane, almost like those of an aneurism. The wall of the sac is thus greatly thickened, so that the tumour may give the sensation of being solid (2110). In the central part of the cavity the serum accumulates, mixed with the greater part of the red corpuscles; these disintegrate, and the result is a thick fluid having the colour of coffee-grounds. The testicle bears the same relation to the swelling as in hydrocele (2113). From a very early

pyriform
Haematocele - globular.

period the swelling assumes a more globular form than is observed in hydrocele, probably in consequence of the thickening of the wall by the deposited fibrin; it is, of course, opaque. The globular form, the opacity, and the tense solid or elastic feel make a hæmatocele resemble a solid tumour so closely that a diagnosis is often impossible without incision. Suppuration may occasionally occur (2112).

In rare cases a hæmatocele results from hæmorrhage into the spermatic cord or into the coverings of the testicle external to the tunica vaginalis (2114).

2110. A testicle, with its coverings, and part of the spermatic cord. The tunica vaginalis has been distended by effusion of blood within it so as to form a tumour about the size of a fist, the general shape being pyriform; this has been laid open along its anterior aspect. The edge of the incision shows that the tunica vaginalis and its coverings are inseparably blended together, forming a layer of considerable thickness. The interior of the sac is of a brownish colour, and flocculent masses of fibrin are adherent to it, partly floating free within its cavity. The testicle forms a smooth projection into the interior of the sac at its posterior and lower part. On the external aspect posteriorly an incision has been made exposing the tubular substance of the testis, which is perfectly healthy. The tunica albuginea and coverings are thickened. 3648

It is evident that before removal the tumour must have been opaque and slightly lobulated on the surface, and that the position of the testicle could not have been recognised. It was removed on the supposition that it was a new growth in the testicle. The patient attributed the disease to a kick received five years before. After the first swelling a permanent enlargement remained. He afterwards received a second injury from a fall on the back of a pig. On the introduction of a trochar into the tumour some time later half a pint of coffee-coloured fluid, containing blood-corpuscles, escaped.

2111. A testicle with its coverings laid open from the front. The cavity of the tunica vaginalis is considerably distended, forming, with the testicle, a tumour of a globular form, about 8 cm. in diameter. The interior of the sac is lined with a shreddy buff-coloured layer of coagulated blood. The body of the testicle, covered with the layer of clot, can be seen projecting into the cavity of the tunica vaginalis. Externally there is no indication of the situation of the gland. 3789

2112. A testicle and its coverings, in section, removed by operation for suppurating hæmatocele. The body of the testicle as displayed by the section is small, but otherwise normal in appearance. The coverings of the testicle are greatly thickened. The cavity of the tunica vaginalis is distended, and its inner surface covered with a ragged flocculent layer, probably composed partly of altered coagulum, partly of inflammatory exudation. The distended tunica vaginalis, together with the testicle and its thickened coverings, forms a mass which in its longest diameter measures 10 cm. A strip of the scrotal tissues is adherent to one part of the specimen. 7001

From a man, aged 30, who was admitted into U. C. H. under the care of Mr. Godlee, June 26, 1893. There had been a hydrocele on the left side for 4 years; this had been tapped five times in the course of the last two years. At the last tapping, 5 weeks before admission, 10 ounces of blood were withdrawn; on the following day the swelling was as large as before, and subsequently increased in size, with much pain and inflammation of the scrotal tissues. On admission the temperature was 101°·4; the left testicle was enlarged to the size of a cocoa-nut; the overlying skin was inflamed, and in parts adherent; the tumour was elastic; the spermatic cord was swollen; the glands in both groins, especially the left, were enlarged. On June 29 the testicle was removed. During the operation a cavity containing foul pus and broken-down blood-clot was opened. The wound had nearly healed when the patient was discharged on July 25. (Mr. Godlee's *Case-books*, 1893, p. 639.)

2113. A hæmatocele of the tunica vaginalis, removed by operation and opened. The sac is ovoidal in shape, and measures 13 cm. and 7 cm. in its two chief diameters. The wall is dense and fibrous, and in some parts measures 5 mm. in thickness. The inner surface of the sac is lined with an irregular layer of brownish-red coagulum. At the lower part of the posterior aspect of the specimen an incision has been made into the testicle, the substance of which is normal in appearance. 9399

From a man, aged 59, under the care of Mr. Christopher Heath. He had had a hydrocele for 8 years, which had been tapped 8 or 9 times, on the last two occasions the fluid being blood-stained. After the last tapping the sac refilled in 48 hours. There was no history of injury.

2114. A blood-cyst, together with part of the skin of the scrotum, removed by operation and divided. The cyst is ovoidal, and measures 4·5 cm. in its longer diameter; it is filled with coagulum. The cyst-wall varies in thickness, and in its superficial part is intimately connected with the subcutaneous tissue. 9393

From a man under the care of Sir Victor Horsley. There was a distinct history of injury. The blood-cyst was removed by operation; it was situated above the body of the testicle, and was unconnected with the tunica vaginalis.

ACUTE INFLAMMATION OF THE TESTICLE.

Acute inflammation of the testicle may begin in the body (*acute orchitis*) or in the epididymis (*acute epididymitis*), but it rarely remains limited to one part. The commonest cause of inflammation commencing in the epididymis is gonorrhœa, but epididymitis is a not uncommon complication of various diseases and injuries of the urethra, prostate, and bladder. Acute inflammation commencing in the body is sometimes traumatic; occasionally it is believed to be of rheumatic or gouty origin, or it may occur as a complication of certain infective diseases, particularly mumps.

Acute abscess of the testicle is rare; it may occur as a manifestation of pyæmia.

2115. A testicle with its coverings. The tunica vaginalis is inseparably blended with the other superficial coverings, and has been laid open in front; it is lined internally with a thin flocculent layer of inflammatory exudation. The body and the epididymis are both considerably enlarged. The smooth rounded mass at the upper part is the swollen globus major; two small pedunculated hydatids of Morgagni are seen at its free extremity. The cord seems to be swollen, but its constituent vessels and the vas deferens are healthy (see No. 2116). 763

When fresh, the tunica vaginalis was distended with turbid fluid.

2116. The opposite testicle, with its coverings and the spermatic vessels from the same case as the preceding specimen. The testicle with its coverings forms a pyriform mass about 12 cm. in length by 8 cm. in breadth. The distended tunica vaginalis has been laid open along the front; the interior is lined with a rough layer of inflammatory exudation, and the wall is thickened and adherent. The body of the testicle projects into the tunica vaginalis; it is swollen to about twice its natural size. An incision into the epididymis at the posterior part shows a dilated plexus of veins imbedded in a mass of inflammatory exudation. The constituents of the cord have been separated. The vas deferens is turned down and is healthy. There are two spermatic arteries, which can be recognised by their straight and unbranched condition. There are seven chief veins; they are tortuous, and some of them are filled with disintegrating and decolorised blood-clot.

From a Creole lad, aged 18, who was admitted to the hospital ship at Greenwich in a dying state. He had had no food for two days, and was much exhausted. No very definite history of his illness could be obtained from him. His scrotum was greatly swollen, and there was high fever. On dissection all the viscera were found healthy. In the tunica vaginalis was a quantity of yellow serum, in which flocculi of lymph were floating. In the course of the spermatic vessels was a "long mass of substance, which was composed of the vessels that are unravelled in the preparation held together by coagulable lymph." This mass reached as high as the kidney.

TUBERCULOUS DISEASE OF THE TESTICLE.

Tuberculous disease of the testicle may affect that organ only, but very frequently it forms part of an extensive affection of the genito-urinary tract (2173). In the latter case it is often doubtful at which point the disease commenced. It may begin in the prostate, vesiculæ seminales, or bladder, or ~~even~~ in the kidney, and extend to the epididymis, and subsequently affect the body of the gland. In whatever way it commences, it is an almost invariable rule that the epididymis is the part of the testicle earliest and most extensively diseased.

The part earliest affected is in most cases the globus minor (2117), less frequently the globus major; but before long the whole epididymis is usually involved (2123). It may thus form a nodular mass embracing the body and exceeding it in size. Subsequently the disease advances into the body through the mediastinum. The new growth follows the ordinary course of tubercle elsewhere; it early undergoes caseation, and after a time softens. The diseased epididymis then becomes adherent to the skin, suppuration takes place around the softening tubercle, and the abscess bursts, discharging curdy pus, and leaving a cavity with ragged yellow walls, which subsequently contracts to a sinus (2121, 2124).

A section of the gland in the advanced stage usually shows the epididymis completely replaced by a yellow caseous mass, softening in parts; this extends through the mediastinum for a varying distance into the body. The advancing edge is usually semitransparent and firm in consistence, and often numerous nodules, varying in size from 1 mm. upwards, are seen in advance of the main mass in the tubular structure of the gland (2120).

The disease often runs its course without the occurrence of effusion into the tunica vaginalis; but occasionally a secondary hydrocele is present (2126, 2124), and in some instances the cavity is obliterated by adhesions (2123).

The cord is, as a rule, healthy, with the exception of the vas deferens; this is considerably enlarged, often irregularly, in fusiform swellings. A section of the diseased duct shows that its external fibrous coat is thickened and its lumen is completely filled with yellow caseous matter, replacing the mucous membrane (2124, 2125); by the softening of the caseous matter one or more chronic abscesses may form along the line of the duct (2117). In No. 2132 one of the fusiform swellings has softened just after the vas deferens has passed the internal abdominal ring, and formed an abscess, which has burst into a coil of the small intestine. The specimen also shows the extension of the disease to the vesiculæ seminales.

Microscopic examination of the diseased gland shows that when the body is affected the tuberculous growth extends between the tubules, which subsequently become choked by proliferating epithelium. The tubules and their contents share in the subsequent destruction and are lost in the caseating mass. The structure of the advancing edge is the same as that of tubercle elsewhere.

In some rare cases of patients dying of tuberculous disease the testicle may be affected more widely and in a more diffuse manner, the whole body of the gland and the epididymis being converted into a globular caseous mass (2131). This condition is not common.

Should chronic suppuration occur in the body of the testicle and the abscess discharge itself through the scrotum, the remains of the inflamed gland-tissue may protrude, forming a so-called *hernia testis* (2128, 2129).

2117. A section of a tuberculous testicle, together with part of the spermatic cord, injected. The disease is limited to the globus minor of the epididymis, and the vas deferens. The body of the testicle, the globus major of the epididymis, and the tunica vaginalis appear to be perfectly normal. The globus minor of the epididymis is enlarged by a caseous tuberculous deposit, the central part of which has softened and disappeared. In the vas a similar caseous deposit, which has softened into a chronic abscess, has been laid open; above and below the abscess a bristle has been passed into the lumen of the tube. The tuberculous deposits contrast strongly in colour with that of the other parts of the injected organ.

From a man, aged 26, who was admitted into U. C. H., under the care of Mr. Barker, in December 1885. There was no family history of tubercle, but the patient had previously suffered from cough and blood-spitting. There was a history of gonorrhœa and a chancre two years before admission, followed, after several months, by enlargement of the right testicle during an attack of scarlet fever, and seven months before admission the right testicle was removed. Enlargement of the left testicle followed, and on admission there was a hard nodule in the lower part of the epididymis and nodular enlargement of the vas. The testicle was removed, and the patient was discharged on the 21st day. (Surg. Reg. Rep. 1886, p. 71, No. 2581.)

2118. A section of a tuberculous testicle, injected. The disease affects chiefly the globus minor of the epididymis, which is converted into a yellow caseous mass, 4 cm. in its greatest diameter, and nearly equal in size to that of the body of the testicle. By the pressure of this mass the adjacent part of the body of the testicle is flattened, but the line of its surface is clearly indicated by the slightly thickened tunica albuginea, through which the disease has extended from the epididymis into the body in the form of a small caseous deposit. The remainder of the body of the testicle, as well as the globus major of the epididymis, present healthy appearances. The tunica vaginalis is normal. The section of the lower part of the vas shows a yellow caseous deposit. 6673

There is no history to the specimen.

2119. Half an injected tuberculous testicle, with a small piece of the skin of the scrotum attached to it. The body and the globus major are apparently perfectly healthy. The lower border of the body has become concave from the pressure of the mass formed by the diseased globus minor, between which and the healthy tubular substance of the gland the tunica albuginea is clearly recognisable. The diseased globus minor, with the chronically inflamed tissue of the scrotum adherent to it, forms a mass considerably larger than the body itself. At its upper part, where it touches the body, is an oval mass 2 cm. in its longest diameter, softening in the centre, so as to form a ragged cavity, the margin of which is composed of numerous small yellow nodules about the size of ordinary grey granulations. Below this is a piece of the globus minor in which the tubular structure is clearly recognisable. The cross-sections of the tube seem wider than natural, and around the lumen is a yellowish zone apparently due to caseation of the new growth in the subepithelial tissue. The coils of the tube are separated by an excessive amount of tissue, into which the injection has entered very freely. Below this area is a softening caseous mass similar to that above mentioned, covered superficially by a dense fibroid layer composed of the tissue of the scrotum, infiltrated with the products of chronic inflammation. The section of the vas deferens shows a yellow zone surrounding the lumen similar to that in the tube of the epididymis. 5581

2120. A section of a tuberculous testicle, injected. The epididymis is enlarged by a yellow caseous deposit into a pyriform mass 3·5 cm. in length, which lies behind the body of the testicle with its larger extremity upwards. Posteriorly the tuberculous disease has perforated the coverings of the epididymis. In the upper extremity of the body of the testicle is another tuberculous deposit in which caseation has not advanced to the extent seen in the epididymis; around this several tuberculous nodules, not more than 1 mm. in diameter, are seen in the gland-tissue. The tunica vaginalis and the part of the vas preserved in the specimen are normal.

From a man, aged 31, who was admitted into U. C. H., under the care of Mr. Berkeley Hill, on December 29, 1885. There was no history of tubercle, and there were no signs of disease of the lungs. Four and a half years before admission the patient had gonorrhœa; swelling of the left testicle began seven months before admission; an abscess formed and burst. There were two sinuses in the scrotum over the enlarged epididymis. The testicle was removed. and the patient discharged on the 20th day. (Surg. Reg. Rep. 1886, p. 71, No. 2648.)

2121. A tuberculous testicle, in section, together with part of the spermatic cord and a strip of the scrotal tissues. The lower half of the epididymis is enlarged by an extensive caseous deposit, which has broken down into a number of small abscess-cavities. The other parts of the testicle and the spermatic cord appear to be normal. In the skin of the scrotum covering the diseased part of the epididymis are two large sinuses. 8094

From a man, aged 72, who was admited into U. C. H., under the care of Mr. Godlee, in Oct. 1898. Three years previously he had been treated for stone in the bladder, and had since that time used a catheter at frequent intervals. In March, 1896, an abscess in connection with the left testicle was opened and healed; in July, 1898, other abscesses were opened and drained. On admission there were sinuses in the scrotum over the lower part of the left testicle; there was a nodular enlargement in the globus minor of the right epididymis; the prostate was enlarged and indurated. The left testicle was removed on Oct. 11. The patient left the hospital on Nov. 4, in a very weak condition, with troublesome cough and irregular fever; the wound was unhealed. (Mr. Godlee's *Case-books*, 1898, vol. ii, p. 112.)

2122. A tuberculous testicle with part of the spermatic cord, in section. There is a cavity with ragged walls in the globus minor of the epididymis. A similar cavity exists in the globus major. The tissues around the cavities are indurated by chronic inflammation. In the situation of the mediastinum testis is a dense mass of indurated tissue continuous with that surrounding the cavities in the epididymis. Scattered throughout the body of the gland are numerous opaque yellowish-white spots about the size of millet-seeds (miliary tubercles commencing to caseate). The intervening gland-substance appears healthy. The vas is normal. 5733

The testicle was removed after death from a man with tuberculous disease of the prostate.

2123. A section of an injected tuberculous testicle, together with part of the spermatic cord and a piece of the scrotum. The whole of the epididymis is converted into a firm caseous mass, which surrounds the posterior and upper aspects of the body of the testicle. The latter is compressed, and the tuberculous disease is extending into it from the epididymis in the form of two caseous nodules. Behind the epididymis, and separated from it by some of the injected veins of the cord, is the vas, which in its lowest part is greatly enlarged by caseous deposits similar to those in the epididymis; above the level of the upper end of the epididymis the vas, as far as it is preserved, is distinctly enlarged. The two layers of the tunica vaginalis are adherent. In the part of the skin preserved on the posterior aspect of the testicle is a deep puckering, indicating the position at which an abscess had at some time discharged. 6450

From a patient, aged 17, who was admitted into U. C. H., under the care of Mr. Heath, in January 1889, for swelling of the right testicle, which had been noticed for nearly three years. Six months after the onset an abscess in connection with the testicle had been opened. There was enlargement of the lower half of the left epididymis; there was no enlargement of the prostate nor sign of lung disease. The right testicle was removed. The patient left the hospital on the 29th day. (Surg. Reg. Rep. 1889, p. 94, No. 188.)

2124. A tuberculous testicle in section. In the epididymis are numerous caseous deposits, and adherent to the globus minor is a small piece of the scrotum in which a sinus is situated. The part of the vas preserved in the specimen is enlarged, and its lumen occupied by caseous matter. The body of the testicle is normal. The tunica vaginalis is distended into a hydrocele, and in the upper half of the specimen several small nodules, probably tuberculous, are seen on both layers of the serous membrane. 6575

There is no history to the specimen.

2125. A section of a tuberculous testicle. The epididymis in its whole extent is enlarged by firm caseous deposits, which are most extensive at the upper and lower extremities. The body of the testicle is somewhat compressed, but otherwise normal, and is surrounded behind and at its two extremities by the diseased

Note that glands are not described as enlarged.

epididymis. The greater part of the parietal layer of the tunica vaginalis has been removed; it appears to have been loosely adherent to the visceral layer, the surface of which is rough. The vas is only slightly enlarged, but the lumen is full of cheesy matter, which, at the upper end of the part preserved, forms two fusiform nodules. 7433

There is no history to the specimen.

√ **2126.** Half an injected tuberculous testicle, together with an adherent portion of the scrotum. The body of the testicle is infiltrated throughout with caseous deposits, the largest of which, at the posterior part of the gland, is softening. The globus minor of the epididymis is not diseased; in the globus major is a round caseous mass, 6 mm. in diameter; from the body of the epididymis the caseous tubercle extends through the lower part of the cord and involves the scrotal tissues, in which are two sinuses marked by bristles. The tunica vaginalis is distended into a hydrocele, which extends upwards along the cord for a distance of 7 cm. above the testicle. From the front of the body a membranous septum passes across the cavity of the hydrocele to the parietal layer of the tunica vaginalis and, in the complete specimen, divided the hydrocele into upper and lower parts. The inner surface of the tunica vaginalis is in parts roughened by inflammation and presents a few scattered nodules. The vas is enlarged and a longitudinal section shows caseous matter in its interior. 3742

The testicle was removed by Mr. Syme. Before the operation it was thought to be a tumour.

2127. A child's testicle in section, the body and epididymis being both enlarged by tuberculous disease. The testicle measures 5 cm. in length, and is oval in outline. The globus major of the epididymis is easily recognised on the upper surface of the body of the testicle; the rest of the epididymis and the body are only indefinitely separated by a line of fibrous tissue, the two parts taking about an equal share in the enlargement. The cut surface is compact and marked by opaque yellowish streaks and nodules. The two layers of the tunica vaginalis are extensively adherent. 8511

Microscopic Structure.—There is an extensive tuberculous deposit between the tubules of the testicle and in the epididymis.

From a child, aged 3½ years, who had been losing flesh for a year before his admission into U. C. H., in 1900. There had been painless but increasing swelling of the left testicle for three weeks; there was no enlargement of the right testicle. The left testicle was removed and was regarded as sarcomatous. (Surg. Reg. Rep. 1900, p. 112, No. 779.)

2128. A tuberculous testicle, together with an elliptical piece of the scrotum, through which a so-called hernia testis protrudes. Of the parts which were still contained within the scrotum, all that can be recognised are part of the enlarged epididymis and the commencement of the vas; the latter is enlarged and the divided lumen is seen to be full of firm caseous matter. Protruding through the scrotum is a rounded, slightly nodular mass, 3·5 cm. in diameter; this mass consists, in its superficial parts, of granulation-tissue, and doubtless contains within it the remains of the body of the testicle. 6596

From a man, aged 40, who was admitted into U. C. H., under the care of Mr. Heath, in December, 1890. A brother had died of consumption. Three years before admission the patient first noticed swelling of the left testicle, in connection with which numerous abscesses subsequently formed and discharged, until, five months before admission, a mass protruded through the skin of the scrotum. The parts preserved in the specimen were excised, and a caseous mass in the right epididymis scraped. The patient left the hospital on the 15th day, the wound being healed except at the upper end, where there was still slight suppuration. (Surg. Reg. Rep. 1890, p. 90, No. 2044.)

2129. A section of a tuberculous testicle and of part of the scrotum, through which a large so-called hernia testis protrudes. The section passes through an opening in the skin which has a vertical diameter of 4 cm.; through this opening a large, lobulated, and deeply cleft mass protrudes, having a diameter of 7·5 cm. The section shows that the protruding mass consists, in its central portion, of part of the body of the testis, which is fibroid but does not present any caseous deposits; the superficial parts of the mass consist of large, irregular lobules of exuberant granulation-tissue covering the testicle-substance. Lying immediately within the scrotum is seen part of the epididymis in section; it presents numerous caseous deposits. The part of the vas preserved in the specimen is slightly enlarged. 6842

There is no history to the specimen.

2130. A wax model of a hernia testis, probably due to tuberculous disease. 2755

2131. Two halves of the testicles removed after death from a man who died of phthisis. Both present the same appearances, but in the upper specimen the section has passed more directly through the epididymis. In each the body is enlarged, but not materially altered in form; all trace of lobules is lost, the substance of the body being converted into a yellowish caseous mass, almost uniform in appearance, being only broken here and there by irregular lines of fibrous tissue; the cut surface is smooth, and the caseous mass is nowhere softening. The tunica albuginea is unaltered. The visceral and parietal layers of the tunica vaginalis are for the most part adherent. In the upper specimen the globus minor is converted into a similar caseous mass, which is commencing to soften; the globus major is similarly but less extensively affected. The vas deferens on each side is enlarged, and its lumen is filled with softening caseous matter.

2132. A lateral view of the contents of the pelvis and part of the penis, together with the left vas deferens and testicle and a piece of small intestine, from a patient who suffered from tuberculous disease of the prostate gland and testicle. The urethra has been laid open through the left side. The bladder is contracted. The parts between the base of the bladder and rectum, including the vesicula seminalis, the prostate gland, and areolar tissue surrounding them, are indurated and matted together into a dense mass, in which the individual structures are scarcely recognisable. In the midst of this is a cavity the outer wall of which has been cut away; its interior is ragged, and its walls are yellow and cheesy. The cavity has the appearance of having been produced by the breaking-down of a cheesy tuberculous mass, chiefly situated in the prostate gland; anteriorly it opens widely into the prostatic portion of the urethra. The vas is greatly enlarged; at a point apparently immediately after it leaves the inguinal canal the parietal peritoneum has become inflamed over it, and to the inflamed spot a coil of the lower part of the ileum has become adherent. Subsequently, in consequence of the softening and breaking-down of the cheesy matter choking its lumen, the vas deferens has perforated into the adherent coil of small intestine. The opening in the gut is smooth at its margin and presents no signs of recent ulceration. The section through the testicle shows that the body is fibroid and the seat of numerous small caseous deposits. The greater part of the body of the epididymis has been converted into a ragged cavity by the breaking-down of the caseous tuberculous matter within it; it opens superficially by a small hole, through which a piece of whalebone has been passed. The globus major and globus minor are both greatly enlarged, and are converted into soft cheesy masses, in which but little trace of the original structure is discernible. 4993

From the very advanced state of the disease in the prostate it is probable that it was the starting-point of the tuberculous growth. The mass formed by the diseased prostate and vesicula seminalis would have been readily perceptible from the rectum during life, and would have aided in the diagnosis of the affection of the testicle. At the same time the condition of the testicle would have suggested the nature of the prostatic affection, which doubtless caused great irritability of the bladder and pain during and after micturition.

SYPHILITIC DISEASE OF THE TESTICLE.

Syphilitic affections of the testicle are usually met with in the later stages of the disease, often occurring many years after the primary infection. The disease of the testicle is characterised by two changes in the organ, which usually occur in association—fibroid overgrowth and the formation of gummata. The body of the testicle is chiefly affected. In a well-marked example the tunica albuginea is greatly thickened and sends dense fibrous septa into the substance of the gland (2134); between these fibrous septa are seen the gummatous deposits, which vary much in size and number, and may more or less completely replace the tubular substance (2134). The gummata appear as tough yellowish-grey masses, which, especially in an injected specimen, contrast strongly with the remains of the testicle-substance and cut with a smooth section (2133). In different specimens the relative proportion of fibroid overgrowth and gummatous deposit varies much. As the disease advances the gummata may soften (2140), and, if this change occurs in the superficial part of the gland, the scrotum may become adherent and the softened gumma break down through the integument (2141), and in rare instances a hernia testis may result.

The disease of the body of the testicle is almost invariably associated with effusion of fluid into the tunica vaginalis; adhesions between the two layers are common, so that the hydrocele may be limited to one part of the gland (2133). The epididymis usually remains unaffected (2133), but occasionally gummata are found in it (2142), and in the later stages of the disease the epididymis may be concealed by the general fibroid thickening, which involves all parts of the organ (2135). The cord and vas are healthy. The disease is not uncommonly bilateral.

The contrast between a syphilitic and a tuberculous testicle is well seen by comparing Nos. 2133 and 2120.

In congenital syphilis the testicle is occasionally affected, the body of one or both organs being indurated and enlarged as the result of a diffuse connective-tissue overgrowth (2143).

2133. Half a syphilitic testicle, injected. The two layers of the tunica vaginalis are adherent over the lower half of the body; above this point the cavity has been distended into a hydrocele, about equal in size to the enlarged body; a band passes across the cavity, one end of which is attached to a small piece of the healthy globus major, which is seen in section; the tunica vaginalis is very slightly thickened. The body of the testis is irregular in form, the altered shape being due to the formation within it of two large syphilitic gummata. The upper of these is oval in form, and occupies the whole upper part of the body of the testis without greatly altering its shape or size. The lower measures nearly 4 cm. in its long diameter, and has considerably increased the diameter of the lower end of the gland. The gummata are dense and smooth on section, yellow in colour, and marked by wavy lines of fibrous tissue. Between the two is a thick band of healthy testicle-substance, into which the injection has freely entered. The injection has in many parts coloured the fibrous tissue at the margin of the gummata, but has not entered into their substance. The tunica albuginea is slightly thickened. 37

2134. Half a testicle removed for syphilitic disease. The body of the testis is but slightly enlarged; all trace of healthy tubular substance is lost, its place being occupied by a number of closely-packed rounded gummata, varying in size from a pea to a bean; between these is some dense fibrous tissue, continuous with that of the tunica albuginea, which is much thickened. The gummata are smooth on section, yellowish in colour, and dense in structure; they cause very slight lobulation of the anterior surface of the testis. Behind and at the lower part of the body portions of the epididymis are seen in section; the globus minor is apparently healthy, the remainder of the epididymis is thickened by an overgrowth of the connective tissue. The tunica vaginalis is distended above so as to form a localised hydrocele about equal in size to the testicle; below, its two layers are adherent. The cord and vas are healthy. 5680

2135. A syphilitic testicle in section. A piece of skin is adherent to the lower part of the specimen, in the centre of which is a ragged oval ulcer, the edges of which are undermined and the surface nodular. The various coverings of the testicle are indistinguishable, the whole forming a dense fibrous layer. No trace of healthy tubular substance is to be recognised, its place being occupied almost entirely by yellow masses, which, from the smoothness of the cut surface, are evidently very dense and tough. These are gummata. On the right side of the section six separate oval gummata at least can be recognised, separated by dense fibrous tissue; on the other side the separate gummata are not so clearly recognisable. In the left half of the specimen the upper and lower extremities of the epididymis can be recognised; they are embedded in the dense fibrous coverings of the testicle. The vas deferens has been dissected out and is healthy; a bristle has been inserted into its canal.

2136. Half a syphilitic testicle. The two layers of the tunica vaginalis are everywhere adherent except at the upper part, where they have been separated by a small quantity of fluid. The cord and epididymis, as shown in the section, are healthy. The body of the testicle is of about the normal size; its surface is smooth, the outline of the gland being unaltered. In the lower half of the body is a gumma: it is firm and yellow, and measures 2 cm. transversely by 1·3 cm. vertically; it is uniform in structure and free from softening; its margin is irregular, but sharply defined. Above the gumma are numerous closely placed opaque white lines: these are the thickened septa of the testis curved and pressed together by the gumma; between them narrow lines of tubular substance are recognisable. At the upper part is a portion of testicle-substance 6 mm. in width, which is unaltered in structure. 5351

Microscopic Structure.—The gumma shows a degenerated cellular growth containing a considerable amount of fibrous tissue. The indurated tissue immediately above the gumma consists of dense fibrous bands, between which are seen the remains of the atrophied glandular tissue.

From the dissecting-room.

2137. Half an injected syphilitic testicle. The body, whilst preserving its natural shape, is enlarged by a slightly lobulated gumma, measuring 4 cm. by 3 cm.; the gumma is opaque yellow and tough, and shows no signs of softening. Above and below the gumma remains of the tubular substance can be recognised. The tunica albuginea is slightly thickened. The globus major of the epididymis, which is seen in section, is swollen. The vas is normal. The tunica vaginalis has been distended into a hydrocele, across the cavity of which the two layers are united by long fibrous adhesions.

2138. Parts of two syphilitic testicles from the same patient. The upper specimen is half the right testicle; some skin is attached to it on one side. The different coverings of the gland are fused together, considerably thickened, and densely fibroid in structure. None of the normal tubular tissue can be recognised; its place is occupied by two gummata presenting the usual opaque yellow colour. The upper of these is softening.

The lower specimen is half the left testicle. It closely resembles the other in most respects, but is of much greater size, measuring 8 cm. from above downwards by 6·5 cm. transversely. There is one large gumma below, with two smaller masses above; these are separated by dense bands of fibrous tissue. At the upper part of the specimen are three cavities, probably representing unobliterated portions of the sac of the tunica vaginalis; these contain a considerable quantity of yellowish friable matter, possibly altered blood-clot. The distinct membranous walls of these cavities show that they are not merely spaces formed by the softening gummata. 4799, 4800

The patient was 28 years old. The right testicle was removed by Mr. Liston after the disease had lasted 6 months. A year afterwards the left testicle became similarly affected and was successfully removed. The specimens are described in the old catalogue as "general struma of the gland," and are interesting as showing that at the time they were removed syphilitic disease of the testis was not recognised.

2139. Half an injected syphilitic testicle. The external surface is covered by the tunica vaginalis, with the dartos and remains of the cremaster, all adherent one to another and to the testicle. On the surface is the vas deferens, which has been dissected out; it is apparently healthy. The body of the gland is considerably enlarged and altered in form, so that its anterior surface is flat and its posterior curved; its general outline is smooth. A ragged ulcerating surface exists in front and at the upper part, to which a piece of skin is adherent. The section shows that a syphilitic gumma, apparently implicating the tunica albuginea, but chiefly situated in the tissues superficial to this, enters into the floor of the ulcer. The body of the testicle is enlarged by a large lobulated gummatous mass, behind which is seen the remains of the tubular substance. The gumma is dense and tough, smooth on section, and of a pale yellow colour; in some parts its margin is sharply defined, in others it fuses into the surrounding tissues. The injection has entered but sparingly into the tubular substance; the gumma shows no vessels. The septa between many of the lobules are thickened, and the whole substance is abnormally tough. The globus major of the epididymis is enlarged and fibroid; the globus minor is seen below and is healthy.

2140. Half a testicle greatly enlarged by the development of syphilitic gummata within it. The cut surface shows three gummata, the largest measuring 5 cm. in diameter. The lowest reaches the surface at the bottom of the gland and there protrudes, forming a prominent fungating mass. On one side of this a small piece of skin remains attached. All the gummata are softened in the centre; the circumferential parts are dense and hard. The condition of the remains of the testicle-substance is difficult to recognise; it is tough and hard, but not so dense a ;the gummata; it has shrunk away from these in the spirit, leaving them projecting on the surface of the section. The tunica vaginalis is thickened; the two layers are adherent, except at the upper part, where they are separated from each other by a small collection of fluid forming a localised hydrocele. The tissues of the scrotum are considerably thickened and adherent to the coverings of the testicle. The vas deferens is healthy; a bristle has been introduced into its canal. The state of the epididymis cannot be recognised.

From a man, aged 30, who was in U. C. H. in 1875. Two and a half years before he had suffered from a severe attack of syphilis. The left testicle was first noticed to be enlarged one year ago; since then it had increased, especially during the last eight months, so that on admission there was a very large scrotal tumour of ovoid shape. The upper part was soft and fluctuating. On tapping, a quantity of straw-coloured fluid escaped. There was little tenderness or pain. The cord and glands were normal. The testicle was removed and the patient made a rapid recovery.

2141. A testicle, with an elliptical portion of the skin of the front of the scrotum, removed by operation. The body of the testicle has been divided antero-posteriorly. The layers of the tunica vaginalis are uniformly adherent, and opposite the middle of the body the skin is also adherent and perforated by a deep ulcer, which extends into the substance of the testis. The edges of the ulcer are ragged and undermined. In the body of the testicle, at a point corresponding to the superficial ulcer, is an oval mass of pale yellow colour about the size of a small nut. The limits of this mass are well defined; its central parts are soft and sloughing, the adherent slough forming the base of the ulcer. Especially in the immediate neighbourhood of the gumma the testicular substance is marked by white bands formed by the thickened septa. At the upper part of the section is seen the head of the epididymis, which is healthy. The vas deferens is free from disease. 2169

2142. Half a testicle removed for syphilitic disease and injected. The body is greatly enlarged and the injection has entered freely into it in most parts. In the red substance of the body are opaque yellow patches destitute of vessels; each of these is surrounded more or less completely by a dark red area of excessive vascularity. The nodules vary in size from a small one about the middle of the gland, the size of a millet-seed, to a large mass at the lower part about 4 cm. in diameter. This last has penetrated the tunica albuginea and broken down superficially. Above it is a well-defined oval mass about the size of a filbert. At the upper part of the body the various tunics are indistinguishably blended one with another. Below this the two layers of the tunica vaginalis are separated, and the cavity between them is lined with shreddy inflammatory exudation. The epididymis is greatly enlarged and in its middle portion is infiltrated with gummatous tissue, into which the injection has scarcely entered. The vas deferens has been dissected out and is perfectly healthy. A bristle has been passed into its canal. 5586

2143. A syphilitic testicle of an infant, in section. The body of the gland is enlarged and measures 3 cm. × 1·6 cm. The section shows that the normal tubular substance is replaced by uniform dense white tissue. The epididymis appears to be normal. The parietal layer of the tunica vaginalis has been removed; the visceral layer is normal.

Microscopic Structure.—The tubules are widely separated by a richly cellular connective tissue and the septa are greatly thickened.

From a child, aged 1 year, who was admitted into U. C. H., under the care of Mr. Barker, in January, 1886. There was strong evidence of inherited syphilis. Both testicles, but especially the right, were enlarged; there was no fluid in the tunica vaginalis, and no enlargement of the vas. In spite of mercurial innunction and the administration of mercury internally, the enlargement of the testicle increased. The right testicle was removed, the disease being regarded as possibly tuberculous. The child was discharged on the 19th day. (Surg. Reg. Rep. 1886, p. 71.)

2144. A right testicle, together with part of the right lung from the same case, showing changes, probably the result of syphilis. The body of the testicle as displayed by the section is healthy. The tunica vaginalis is slightly distended and much thickened, presenting at one part a large plate of almost cartilaginous hardness. Below the testicle the coverings are converted into a very hard crescentic mass 2 cm. in thickness and composed of dense fibrous tissue. Superiorly this fibrous mass ends in an abrupt rounded border. The coverings of the cord are thickened and the cremaster hypertrophied; the vas is enlarged.

The superficial part of the lung preserved in the specimen is converted into a dense white fibrous mass, streaked by pigment and marked off by an irregular but well-defined margin from the adjacent lung-tissue.

From a man, aged 38, who was admitted into U. C. H., under the care of Sir Thomas Barlow June 11, 1902. Death occurred on June 21 after repeated attacks of hæmatemesis. (Sir Thomas Barlow's *Case-books*, 1902, vol. i, p. 825.)

TUMOURS OF THE TESTICLE.

On account of the complex structure of many tumours of the testicle no very satisfactory classification can be made of them. The difficulty is increased by the fact that, although the ordinary sarcomata and carcinomata pursue the usual malignant course, other tumours, especially of mixed structure, differ much in their clinical features, without any apparent corresponding difference in their histological structure. The specimens described below illustrate the three common forms of tumour of the testicle—sarcomata, carcinomata, and mixed tumours. In malignant disease of the testicle secondary deposits are very common in the lymphatic glands, those first affected being the glands which lie in front of the aorta, the upper median lumbar glands. The inguinal glands may be involved if the disease of the testicle has implicated the tissues of the scrotum.

SARCOMA OF THE TESTICLE.

Round-cell, spindle-cell, and mixed-cell sarcomata are met with in the testicle, the small round-cell variety being by far the most common. In some of the small round-cell sarcomata the cells lie in a delicate reticulum formed by branching cells and the tumour has therefore the structure of a lympho-sarcoma.

The sarcomata form soft vascular tumours, filling and distending the tunica albuginea and completely replacing the glandular substance (2145). The growth is often divided into lobes by bands of fibrous tissue, possibly the remains of the septa of the gland (2145). The central parts of the growth are often yellow in colour from fatty degeneration. Cysts are occasionally present, formed by softening of the growth or by hæmorrhage (2154). In the early stages the tunica vaginalis may be distended with fluid. When the tumour reaches a considerable size the layers of the tunica vaginalis become adherent (2146), and finally the distended coverings give way, and the skin becomes adherent to the growth. Lastly, ulceration occurs, and the sarcoma forms a soft fungating vascular projection, the so-called *fungus hæmatodes* of the older writers (2151). In advanced cases the epididymis becomes affected, and the disease extends upwards along the cord (2149). These tumours are very malignant and cause early glandular infection; they may occur in very young children (2153), but are most common after middle life.

No. 2154 is an example of a sarcoma originating in a testicle retained in the abdominal cavity.

2145. Half a large sarcoma of the testicle removed after death. The tumour is completely enclosed in the tunica albuginea. The parietal and visceral layers of the tunica vaginalis are closely connected by bands of adhesion over the greater part of the lower half of the tumour; behind the lower end of the tumour there is a small localised hydrocele. In the fresh state some of the closed spaces formed by these adhesions were filled with soft caseous material. The epididymis is not to be distinguished from the body of the gland. The section shows the tumour to be made up of four lobes separated by septa of fibrous tissue. The tumour presents a uniform spongy structure darkly stained with blood; in the upper half are some large spaces which were filled with blood, apparently resulting from hæmorrhage into the substance of the tumour. Towards the front of the testicle is a small cyst about the size of a pea; its walls are extremely thin and transparent; the contents are solid, white, and laminated, as if composed of layers of epithelium. The cord is not implicated at the point at which it has been divided.

6112

Microscopic Structure.—The tumour is a round-cell sarcoma. The cells are tolerably uniform in size, and slightly larger than white corpuscles; they are enclosed in the spaces of a reticulate stroma.

The patient died of some general infective process of the nature of pyæmia, the cause of which could not be ascertained.

2146. Half a sarcoma of the testicle, measuring 8 cm. and 6 cm. in its chief diameters. The growth is included within the tunica albuginea, which is considerably thickened. The cut surface is yellowish white and presents an almost homogeneous appearance. Here and there large vessels are seen in section on the surface. The cord is healthy. The cavity of the tunica vaginalis seems to have been obilterated by adhesion of the opposed surfaces. 4798

Microscopic Structure.—The tumour is composed of a stroma of delicate fibrous tissue, crowded with small round cells with circular nuclei. This tissue is arranged so as to form a coarse reticulum, the spaces of which are in some parts as large as the ordinary alveoli of a cancer. They contain rounded cells about twice the size of white corpuscles. The margins of the spaces are not, however, clearly defined, and processes of the stroma appear to penetrate between the individual cells. The tumour is therefore a small round-cell sarcoma.

The tumour was removed by Mr. Liston. The patient recovered, and there was no return after some years.

2147. Half a sarcoma of the testicle, measuring 14 cm. from above downwards and 10 cm. from before backwards. The two layers of the tunica vaginalis are adherent over the middle of the anterior part of the tumour; above and below this the cavity is distended into a localised hydrocele. The tunica vaginalis and the tunica albuginea are considerably thickened. The section of the tumour shows that it is composed of numerous irregular rounded lobules of a spongy consistence, separated by intersecting bands of fibrous tissue. In the lower part of the tumour numerous small semitranslucent spots are seen on the surface of the section. The upper extremity of the tumour extends for some distance along the spermatic cord, but at the level at which it has been divided the latter appears to be healthy. 5641

Microscopic Structure.—The tumour is a small round-cell sarcoma, undergoing mucoid degeneration.

From a man, aged 45. The left testicle was larger than a cocoa-nut, almost smooth, elastic, and at many points fluctuating; there was no testicular sensation, but some parts of the tumour were tender. The skin was not involved; the veins were enlarged; the cord was thickened. There was marked tenderness in the iliac fossa, but no swelling could be felt there. The tumour was tapped, but only blood escaped. The testicle was then removed; secondary hæmorrhage occurred on the 10th day. Death occurred from recurrence in the groin and abdomen, four months after the operation.

2148. Half a sarcoma of the testicle, measuring 7 cm. in diameter. The new growth is enclosed in the distended tunica albuginea; it is exceedingly soft but traversed by firmer bands dividing it into coarse alveolar spaces. At the anterior part is a firmer portion, from which several bands radiate. The tunica vaginalis seems to have been free from adhesions. The epididymis is shown on the outer side of the specimen; it is somewhat flattened and spread out, but is not involved by the growth. 3855

Microscopic Structure.—The tumour is probably a small round-cell sarcoma, but the condition of the specimen renders accurate microscopic examination impossible.

The tumour was removed by Mr. Syme.

2149. Half a sarcoma of the testicle, measuring 10 cm. by 8 cm. The tumour is enclosed within the tunica albuginea and the adherent tunica vaginalis, except in a small area anteriorly, where it protrudes slightly through them in the position of an incision. On the cut surface the tumour is seen to consist of a soft, friable, yellowish substance, intersected, especially in the peripheral parts, by fibrous septa. Above the main mass of the tumour the growth extends into the cord for a distance of 3 cm. to the level at which it has been divided. 765

Microscopic Structure.—The tumour is a small round-cell sarcoma.

"In consultation B. C. B. [Sir Benjamin C. Brodie ?] was of opinion that the disease was hæmatocele, Mr. Bell [Sir Charles Bell] that it was fungous. It was agreed to puncture the testicle before operation, and if blood came the incision was to be enlarged and the hæmatocele exposed, but if there was no blood nor fluid, without further consultation the operator was to proceed to amputation. Blood did flow and the incision was enlarged, but nothing but soft brain-like matter was turned out. The operation of amputation was therefore immediately performed, and it will be seen, from the preparation, in unfavourable circumstances, as the cord is diseased at the part where it has been cut across" (Old Catalogue).

2150. Half a large oval sarcoma of the testicle, measuring 14 cm. by 8 cm. The visceral and parietal layers of the tunica vaginalis are for the most part adherent;

the parietal layer is considerably thickened. The tumour is enclosed by the tunica albuginea, which is somewhat thickened. No trace of the normal tubular substance of the gland can be seen. The tumour is composed of bands of dense fibroid tissue forming coarse alveolar spaces; these are filled with soft tissue, apparently to a great extent undergoing fatty degeneration. The tissue, from long immersion in spirit, has become uniformly white in colour. The cord, where it has been divided, is not affected by the growth. 2111

2151. A sarcoma of the testicle, together with part of the scrotum, through which the tumour is protruding. The tumour, through which a section has been made, is ovoidal in shape and measures 11 cm. vertically. The coverings of the testicle which surround the tumour are inseparably adherent. The tumour-substance is soft and blood-stained and divided into indistinct lobules by fibrous septa. A separate lobule of the growth at its upper extremity involves the spermatic cord, but the latter, where divided, appears to be normal. In the scrotal tissues adherent to the front of the tumour is an irregularly oval opening measuring 8 cm. in its longer vertical diameter. Through this opening the tumour of the testicle protrudes, especially at the lower part, in the form of a soft, darkly blood-stained, fungating mass, above which an irregular excavation extends into the growth. Around the larger opening in the skin are several smaller, ulcerated apertures, in which the tumour-substance is exposed. 6782

This is the condition which was called by the older surgeons "fungus hæmatodes."

Microscopic Structure.—The tumour is a sarcoma, composed of small round and spindle-shaped cells.

From a man, aged 54, who was admitted into U. C. H., under the care of Mr. Heath, Nov 21, 1891. In March 1890 a tumour as large as a walnut was noticed in the left side of the scrotum; in Feb. 1891 the tumour began to increase in size and became painful; in May 1891 the overlying skin became red, and six weeks before admission the tumour began to protrude through it. On Nov. 23 the tumour of the testicle and part of the scrotum were removed. No history of the case was obtained after the patient left the hospital on Jan. 1, 1892, but the presence of some swelling in the inguinal region made it probable that the tumour was recurring in the spermatic cord. (Mr. Heath's *Case-books*, 1892, vol. ii, p. 272.)

2152. Half a sarcoma of the testicle of a child, removed by operation. The tumour is nearly globular and measures 4 cm. in diameter; it is enclosed within the thickened tunica albuginea, between which and the tumour a narrow layer of the tubular substance can in parts be recognised. The cord and epididymis are normal. The layers of the tunica vaginalis are slightly thickened and over the front and lower part of the tumour are adherent. The tumour-substance is soft and friable and yellowish brown in colour. In the upper part of the section are two small cysts, with smooth membranous walls; one of these is darkly blood-stained. 3642

Microscopic Structure.—The tumour is a small round-cell sarcoma. The cells are supported by a very delicate reticulum.

The tumour was removed by Mr. Liston from a child 6 years of age.

2153. A sarcoma of the testicle of a child, in section. The tumour, which measures 4·5 cm. in length, is enclosed in the distended tunica albuginea. It is soft in structure and yellow in colour. The tunica vaginalis is not adherent; the cord and epididymis are unaffected. 5623

Microscopic Structure.—The tumour is a sarcoma; it is composed in great part of a reticulate stroma, the spaces of which are filled with small round cells. Here and there are parts in which the cells are larger and angular in form, and the stroma is more alveolar in its arrangement; but careful examination shows that portions of the stroma pass between the individual cells.

The patient was a child, aged 1½, admitted into U. C. H., under the care of Mr. Heath, in 1881. The growth had been first recognised immediately before admission. The left testicle was the size of a hen's egg, smooth, firm, elastic, not tender or painful; the cord was normal; the scrotum was slightly involved at one part. The testicle was removed, the cord being tied *en masse.* The wound was perfectly healed in two weeks. (Surg. Reg. Rep. 1881, p. 39, No. 143.)

2154. A sarcoma of a retained testicle, in section, measuring 8 cm. by 5 cm. Externally the tumour is invested at all parts by peritoneum, which presents a divided edge at the upper extremity of the specimen. Along one aspect of the specimen the position of the epididymis can be recognised; the globus minor appears to be involved by the growth and forms the lower, rounded extremity of the tumour, which is marked off from the part of the growth which involves the body of the testicle by a deep sulcus. On the divided surface of the specimen the two parts of the tumour—that in the body and that in the globus minor—are clearly defined one from the other. The upper part is irregularly broken down in its central part, probably by hæmorrhage; the lower part is firmer and contains numerous small cysts. 6229

Microscopic Structure.—The tumour is a small round-cell sarcoma. Especially in the globus minor the tumour presents an abundant delicate reticulum, partly composed of branching cells, and has thus the structure of a lympho-sarcoma.

From a man, aged 28, who for eight weeks before his admission into U.C.H. had experienced pain in the region of the left kidney; nine days before admission a tumour was detected in the abdomen beneath the left costal margin. The tumour was thought to be connected with the left kidney, and it was not noticed that neither testicle was in the scrotum. The abdomen was opened in the left linea semilunaris; the tumour was thought to be retroperitoneal, and no attempt was made to remove it. The patient was discharged on the 16th day; he was losing flesh rapidly, and was readmitted three weeks later, and died of progressive emaciation. At the *post mortem* examination the tumour was found to be situated in front of the left kidney; there were secondary growths in the lungs (Medical Catalogue, 1890, No. 3400) and liver (Medical Catalogue, 1890, No. 3149); the right testicle was retained in the inguinal canal. (Surg. Reg. Rep. 1887, p. 79.)

CARCINOMA OF THE TESTICLE.

Carcinoma of the testicle is usually of the soft spheroidal-cell variety, and with the naked eye is difficult and often impossible to distinguish from a sarcoma. Like sarcoma the tumour is very soft and often broken down in parts by hæmorrhage. The tumour usually implicates the cord early and perforates the coverings of the testicle and the skin, when it reaches any considerable size (2157). In the early stage there may be a collection of fluid in the tunica vaginalis. Infection of the lymphatic glands is common at an early stage. Carcinoma of the testicle is usually met with in advanced life.

No. 2159 is an example of a carcinoma of a retained testicle.

2155. Half of a carcinoma of the testicle, oval in form and measuring 13 cm. from above downwards by 9 cm. transversely. The tumour is enclosed in the distended tunica albuginea. The visceral and parietal layers of the tunica vaginalis are united by a few soft adhesions. The section of the tumour shows that the greater part is composed of soft spongy tissue apparently undergoing fatty degeneration. At the lower and posterior part the tissue is firmer and minutely spongy in structure; it is divided into lobules by bands of fibrous tissue. At the top of the specimen is a large lobule of the growth which probably represents the globus major of the epididymis. The cord is not shown in the specimen. 2222

Microscopic Structure.—The tumour is probably a soft spheroidal-cell carcinoma, but its condition renders the microscopic examination unsatisfactory.

The tumour was removed by Mr. Liston.

2156. An injected carcinoma of the testicle in section. The tumour is oval in shape and measures 8 cm. by 6 cm. It is enclosed within the slightly thickened tunica albuginea and is smooth on the surface, except at the upper part in one half of the specimen, where there is a prominent nodular projection. The parietal layer of the tunica vaginalis has been removed; the surface of the visceral layer is smooth and beneath it are numerous large tortuous veins. The epididymis, as seen on the surface of the tumour and in the section, is normal. The part of the cord preserved in the specimen is normal. The tumour-substance is soft and friable and in parts stained a dirty brownish colour by old extravasations of blood. Several small cysts filled with coagulated material are seen on the surface of the section. 8873

Microscopic Structure.—The tumour is a carcinoma. Except in fibrous septa which traverse the growth, the connective-tissue stroma is very scanty. In some parts the epithelium-cells are arranged in irregular masses and are spheroidal in shape; in other parts the structure is distinctly tubular and the cells surrounding the spaces are cubical and arranged in a single layer. It is therefore probable that the tumour originated in the rete testis.

From a man, aged 41, who was admitted into U.C.H., under the care of Mr. Godlee, Nov. 28, 1901. Enlargement of the right testicle was first noticed at the beginning of September; at the middle of October the swelling began rapidly to increase and became painful. There was a history of two attacks of gonorrhœa, but not of syphilis; for three weeks before admission the patient was treated in the out-patient department with iodide of potassium, without effect. The enlargement of the testicle was uniform, smooth, and firm; there was a small collection of fluid in the tunica vaginalis; the spermatic cord was not thickened. The testicle was removed on Dec. 4 and the patient left the hospital on Dec. 16. (Mr. Godlee's *Case-books*, 1901, vol. i, p. 214.)

2157. A wax model of an enormous tumour of the right testicle which was removed by operation. The penis is pushed over to the left side. The surface of the distended scrotum is coarsely lobulated, and is traversed by large tortuous veins. The skin has given way over almost the whole anterior part, forming three openings, through which the substance of the tumour projects. The surface of the projecting tumour is ulcerated and covered with a purulent discharge mixed with blood. The ulceration of the skin extends in some parts to a considerable distance from the projecting nodules of the tumour. (See No. 2158.) 2728

2158. A wax model of the preceding specimen after removal. The mass is composed of rounded lobules separated by bands of fibrous tissue. Its structure appears to be very soft, and cysts are scattered through it. It is for the most part yellowish in colour, but at the upper part there has been considerable hæmorrhage into its substance. The condition of the cord and the relation of the growth to the coverings are not shown in the model. 2789

It was evidently either a soft carcinoma or a rapidly growing sarcoma.

2159. Half a carcinoma of a retained testicle, measuring 13 cm. by 9 cm. The surface of the tumour is irregular and the surrounding fatty and muscular tissue is incorporated with it. The tumour-substance is firm and on the cut surface is seen to be irregularly lobulated. 8361

Microscopic Structure.—The tumour is a spheroidal-cell carcinoma, with an abundant fibrous stroma.

From a man, aged 48, in whom the testicles had from birth been retained in the inguinal canals. He was admitted into U. C. H., under the care of Mr. Heath, Nov. 20, 1899, on account of a large tumour, which extended from the pubes to the left anterior superior iliac spine. The tumour had been first noticed eight months before admission. On Nov. 29 the tumour was removed, together with part of the abdominal wall through which it extended; in so doing the sigmoid flexure was accidentally torn and an artificial anus was made. The patient died from shock and commencing peritonitis 27 hours after the operation. The lumbar glands were slightly enlarged, but were not examined microscopically. The right testicle, which lay in the upper end of the inguinal canal, was small and cystic. (Surg. Reg. Rep. 1899, p. 142.)

MIXED TUMOURS OF THE TESTICLE.

The most important mixed tumour of the testicle is that to which the names Adenoma, Cysto-adenoma, and Cysto-sarcoma have been applied. This tumour presents the following features:—It is encapsuled, and by careful dissection the testicular substance can sometimes be separated as a thin layer spread out over its surface; the epididymis can often be seen to be unaffected (2162); the tumour itself varies much in the relative proportions of the cystic and solid parts, thus in some specimens the section presents a solid tumour-substance studded with minute cysts (2160), whilst in other specimens the whole tumour presents a honeycomb-like structure (2161) or a few large cysts may be present (2163); the contents of the cysts may be serous, blood-stained, or mucoid; occasionally intracystic growths may be recognised with the naked eye. Examined microscopically the stroma of the tumour may be fibrous, richly cellular, or myxomatous, and in it are frequently seen the cross-sections of nodules of cartilage, which may be visible to the naked eye as small opaque-white spots (2160). The cysts are lined with cubical epithelium, and many are usually present which are invisible to the naked eye (2163); occasionally some of the smaller cysts may be completely filled with laminated epithelium, forming pearl-like bodies.

The origin of these mixed tumours of the testicle is uncertain, but it is probable that they originate in the rete testis, and by their continued growth gradually displace the glandular tissue of the body.

No. 2164 is a tumour of very complex structure, having in parts a structure similar to that met with in certain tumours of the uterus (chorion-epitheliomata).

2160. Half a tumour of the testicle removed by operation and injected. The tumour is enclosed in the distended tunica albuginea. There are no adhesions of the two layers of the tunica vaginalis. The tumour is almost globular in form and about 8 cm. in diameter. The section is yellowish-white in colour, and is intersected by pink bands of connective tissue, into which the injection has entered. Numerous cysts, varying in size from a pin's head to a large pea, are seen on the section. In other parts minute white spots are visible, which, microscopically, prove to be composed of cartilage. The veins of the cord are fully injected. The vas deferens is marked by a bristle. The cord is not implicated by the tumour. 6118

Dissection of the opposite half of the tumour showed that it lay within the tunica albuginea, but did not implicate the glandular tissue. This was pushed to one side and spread out into a thin layer, which was easily peeled off the tumour, leaving a distinct layer of fibrous tissue still covering the new growth. The tumour seems to have sprung from the rete testis and to have grown forwards, pushing the glandular substance of the testicle to one side and distending the tunica albuginea.

Microscopic Structure.—The tumour is composed for the most part of very imperfectly developed connective tissue crowded with small round and oat-shaped cells. Scattered everywhere through this are masses of cartilage; these are evidently sections of winding irregular columns; many of them seem to be distinctly encapsuled as if lying in distended lymphatics; but careful examination shows that, in most cases at any rate, this appearance is fallacious, and that there is no sharp line between the imperfectly developed fibrous tissue and the cartilage. Immediately around the cartilage the cells are flattened and arranged parallel to the surface of the column. Here and there tubes lined with a small epithelium, like that of the rete testis, are seen in section. A few masses of epithelium are seen here and there, closely resembling the globes of a squamous carcinoma.

The patient was a healthy man, aged 33. The tumour had been noticed for five months. There was no distinct history of injury. It was painless and, but for its weight, caused no inconvenience. It had been treated by strapping and the application of ointments without effect. Finally a puncture was made, and a few drops of blood only escaped. The tumour was removed by Mr. Beck, and the patient made a rapid recovery.

2161. A slice cut from the middle part of a cystic tumour of the testicle. The surface of the section presents somewhat the appearance of a coarse sponge. One cyst, much larger than the rest, measures nearly 2 cm., and was filled with a soft mass apparently composed partly of blood-clot and partly of solid growth. 5894

The tumour has evidently sprung from the posterior part of the testicle, but its exact relations are not shown.

Microscopic Structure.—The stroma of the tumour is composed for the most part of dense fibrous tissue, but in some places it is more richly cellular. Lying in the stroma are spaces varying much in size and shape and lined with a single layer of low columnar epithelium.

From a man, aged 31, who was under the care of Mr. Christopher Heath in U. C. H. Enlargement of the left testicle was first noticed after a kick, 18 months before admission. The swelling gradually increased, and on admission reached up to the external abdominal ring; it was firm, elastic, and oval in shape; no evidence of secondary growths could be found. The testicle was removed by operation. On the 40th day after the operation the patient became jaundiced and died suddenly of syncope on the 48th day. At the *post mortem* examination the peritoneum was found to contain two pints of blood-stained fluid, and there was a mass of clot between the liver and the transverse colon. There were deposits of growth in the liver and both lungs and a small nodule in the wall of the bladder. The tumours in the lungs and liver were sarcomatous in structure, and did not contain cystic spaces like those present in the tumour of the testicle. (Surg. Reg. Rep. 1883, p. 98, No. 2382; and Horsley, Trans. Path. Soc. vol. xxxiv, 1883, p. 161.)

2162. Half of a large oval cystic tumour of the testicle, measuring 10 cm. from above downwards and 6·5 cm. from before backwards. The tumour, though enclosed within the tunica albuginea, is surrounded by a delicate capsule of its own, readily separable from the thinned and stretched albuginea. The tumour is in parts solid and presents a compact structure traversed by delicate fibrous bands. In other parts, especially near the surface, the tumour presents numerous cysts varying in size from 2 cm. downwards. The cysts present a delicate wall and smooth inner surface, and some are occupied by intracystic growths. Between the cysts, especially in the lower part of the specimen, are numerous small nodules of greyish colour and slightly translucent. Above the tumour a small piece of the healthy globus major of the epididymis can be seen in section. The cord is healthy. 4330

On dissecting the specimen, a few remains of the tubular substance of the testicle were found spread out between the capsule of the tumour and the tunica albuginea, but the chief part of the gland was probably on the other half of the specimen. The growth probably originated in the mediastinum testis. In the recent state the cysts contained curdy matter in a glairy fluid. There was a small quantity of fluid in the cavity of the tunica vaginalis.

Microscopic Structure.—The stroma is in most parts composed of small alveoli filled with rounded connective-tissue cells. Scattered through this are well-defined areas of myxomatous tissue and a few rounded areas of hyaline cartilage. Here and there is seen a space lined with cubical epithelium. In some parts of the tumour are scattered bundles of large fusiform cells with elongated nuclei; these are probably muscle-cells.

The tumour was removed by Mr. Liston in 1829, and the patient died 6 days after with gastro-enteric symptoms.

2163. A testicle removed for a cystic tumour, from the front part of which a wedge-shaped portion has been removed. The tumour is entirely included within the tunica albuginea, and measures 8 cm. in its longer, vertical diameter. Two large cysts have been opened by the section; they present dense fibrous walls, and in most parts a smooth and wrinkled inner surface. The solid tumour-substance, which is most abundant above the cysts, is firm and yellowish in colour; it contains numerous small cysts, some of which are occupied by intracystic growths; especially in the upper part of the tumour, small opaque white spots can be seen in the section, which microscopically prove to be composed of cartilage. No remains of the normal substance of the testicle can be recognised. Over the middle of the tumour the two layers of the tunica vaginalis are adherent, but above the tumour they are separated and form a localised hydrocele. 766

Microscopic Structure.—The stroma is in parts densely fibrous and in others almost entirely cellular. Branching through the stroma are large columns of hyaline cartilage. Abundant spaces lined with a short cubical epithelium are present; in some of these concentrically marked nest-like bodies have been formed from the epithelium.

2164. A tumour of the testicle in section. The tumour is ovoid in form, and measures 11·5 cm. by 6 cm. in its two chief diameters. Over the upper part of the tumour the two layers of the tunica vaginalis are not adherent, but over the lower part they are indistinguishably united into a single fibrous layer. In the upper part of one half of the specimen the surface of the tumour which projects beneath the visceral layer of the tunica vaginalis is lobulated. On the cut surface of the specimen part of the testicular substance can be seen at the upper part. The tumour-substance is coarsely granular, friable, and in many parts stained a brownish colour by altered blood-pigment; it is divided into irregular areas by delicate fibrous septa. In the lower part of the tumour a few small cysts are present.

Microscopic Structure.—The tumour presents in different parts a very different structure. In some parts there is a well-marked connective-tissue stroma containing thin-walled blood-vessels, and here and there presenting small islands of hyaline cartilage. Lying in the stroma are collections of small tubular spaces lined with cylindrical epithelium; in some lobules these tubules are closely packed, and the cylindrical character of the epithelium is less marked. In large areas of the tumour little is seen except a non-staining coagulum, in which are the remains of necrotic tumour-substance. In immediate association with the blood-vessels around the hæmorrhagic areas are masses of epithelium-like cells, which for the most part form a definite thick layer around a vessel outside its endothelium. In some of these cell-masses are branching protoplasmic masses containing numerous nuclei (syncytial tissue).

The tumour is probably a teratoma.

There is no history to the specimen.

2164a. Sheep: normal testicle.

DISEASES OF THE SPERMATIC CORD.

VARICOCELE.

Varicocele is a swelling resulting from a varicose condition of the veins of the spermatic cord, and is not uncommonly associated with a similar condition of the veins of the scrotum. The enlarged veins form a convoluted mass seated above and partly behind the testicle. Varicocele occurs almost invariably on the left side.

Qr. in visceral inversion

2165. A left testicle, together with part of the vas deferens and the corresponding parts of the spermatic veins, which are enlarged so as to form a varicocele. The testicle appears to be normal. 6209

The parts were removed by Mr. Marshall in 1886 on account of the constant annoyance experienced by the patient.

Developed in old age. ? carcinomatous glands.

HYDROCELE OF THE SPERMATIC CORD. *See* HYDROCELE.

SOLID TUMOURS OF THE SPERMATIC CORD.

The only tumour of the spermatic cord which is at all common is lipoma (2166). Such a tumour may closely resemble an encysted hydrocele of the cord or, if lying close to the external abdominal ring, it may be mistaken for an omental hernia.

Myxoma and fibroma have also been met with. The spermatic cord may be involved by the extension of a malignant growth originating in the testicle.

2166. A testicle with the spermatic cord, removed after death. At the upper part of the cord is an oval fatty tumour enclosed in a loose capsule of areolar tissue. Above it is continued upwards by a thin pedicle, giving it the appearance of an old omental hernia uniformly adherent to the sac; but it was clearly demonstrated that it had no connection with the abdomen. 5784

2167. A right testicle and cord with their coverings, and the adjacent part of the abdominal wall. The cord contains a sausage-shaped fatty tumour, 9 cm. in length, which extends from the inguinal canal to the upper end of the testicle. The coverings of the cord by which the tumour is surrounded have been partly removed. 5892

The specimen was removed from a man who died of pyæmia after acute hip-disease.

DISEASES OF THE SCROTUM.

ELEPHANTIASIS OF THE SCROTUM.

True elephantiasis of the scrotum is a disease of tropical countries. The enlargement results from great thickening of the subcutaneous tissue, caused by obstruction of the lymphatics by filariæ. In the early stages the enlarged lymphatics in the skin may discharge large quantities of lymph (lymph-scrotum), and the glands in the groins are enlarged.

DERMOID CYST OF THE SCROTUM.

Dermoids of the scrotum arise by an inclusion of the surface epithelium during the union of the two halves from which the part is developed. Dermoids of the testis itself must have a different origin, for in the lower animals they have been met with in the undescended organ. Dermoids of the scrotum and testis are extremely rare.

2168. A dermoid cyst of the scrotum, 4 cm. in diameter. The cyst-wall is thin and the inner surface smooth. The contents were putty-like and contained a few grey hairs.

Microscopic Structure.—The cyst-wall is composed of fibrous tissue lined with stratified epithelium; the papillæ are very rudimentary; sebaceous glands are present in the cyst-wall.

From a patient, aged 18. The cyst had been present since birth. It was situated in the left side of the scrotum between the testicles, and was adherent to the left testicle. During its removal a few fibres of the cremaster were found coursing over the cyst. It was situated outside the tunica vaginalis. (Surg. Reg. Rep. 1885, p. 74, and Pollard, Trans. Path. Soc. vol. xxxvii, 1886, p. 342.)

CARCINOMA OF THE SCROTUM.

Squamous carcinoma of the scrotum is met with chiefly in chimney-sweeps, the irritation of the skin by the soot, possibly as the result of the arsenic it contains, being in some way the cause of the origin of the growth. The disease usually commences as a pimple or wart with a hard base, which soon ulcerates and assumes the ordinary characters of a carcinomatous ulcer. Secondary deposits are common in the glands of the groin.

2169. A small piece of the skin of the scrotum, removed by operation for carcinoma. The growth measures 2·5 cm. by 2 cm.; it is raised, ulcerated, and in its central part irregularly nodular. The edge of the growth is well defined, and at one part distinctly everted.

The growth was removed by Mr. Heath from a man, aged 35, who had been in the habit of climbing the old-fashioned chimneys in Bedfordshire. The growth began two years previously as a hard pimple with a small "head"; after poulticing, the "head" came off, leaving a small sore which never healed.

2170. The lower part of a scrotum, removed by operation for carcinoma. The growth, which is situated in the left half of the scrotum, forms an irregular ulcer, measuring 4·5 cm. vertically and 6 cm. transversely. The edges of the ulcer are raised, and the inner border, which exactly corresponds to the line of the raphé, is considerably everted; the surface of the ulcer is irregularly nodular, and in parts excavated. A small piece of the tunica vaginalis of the left testicle is adherent to the deep aspect of the growth. In the skin of the right half of the scrotum are several small slightly raised nodules, the largest of which are ulcerated.
2248

The parts were removed by Mr. Samuel Cooper from a chimney-sweep.

2171. The greater part of a scrotum with one of the testicles contained within it. The skin is the seat of a very extensive carcinomatous growth. The mass is oval in outline, and measures 9 cm. by 7 cm. It projects considerably above the level of the surrounding skin, with an overhanging margin. The surface is deeply cleft and fissured, and in many parts ragged. The testicle appears to be adherent to the mass, and partly imbedded in it. The surrounding skin of the scrotum is irregularly pigmented.

From a chimney-sweep, who was in U. C. H., under the care of Sir J. E. Erichsen, in 1866.

2172. A wax model of a carcinoma of the scrotum. The tumour is situated on the left side of the scrotum. It is irregularly oval in form, and measures about 6 cm. by 4 cm. The surrounding skin is normal in appearance. The whole surface of the growth is ulcerated; it is irregular and somewhat excavated in the centre. Its edges are greatly raised and everted, overlapping the surrounding healthy skin. 2787

The growth was removed together with an enlarged gland in the left groin.

DISEASES OF THE VESICULÆ SEMINALES.

Inflammation of the vesiculæ seminales most commonly occurs as a complication of gonorrhœal urethritis, and is often associated with inflammation of the prostate.

Tuberculous disease is met with almost invariably in association with tuberculous disease of the prostate and other parts of the genito-urinary tract.

No. 2174 is a specimen of cystic enlargement of the vesicula seminalis, removed by operation.

✓ **2173.** The bladder, prostate gland, and vesiculæ seminales, with one testicle, from a case of tuberculous disease of the genito-urinary organs. The prostate is but slightly enlarged; its under surface is irregular, the right lobe being more prominent, but extending a shorter distance backwards, than the left. Sections which have been made into the lobes from the sides show that the central part of each is infiltrated by caseous tubercle. Both vesiculæ seminales are considerably enlarged; a section through them shows that the lumen of the tube is surrounded by a ring of caseous tuberculous tissue about 2 mm. in thickness. The lower end of the vas deferens is in a similar condition.

The testicle is healthy, with the exception of the globus minor of the epididymis; this is the seat of a mass of softened tubercle about 1·5 cm. in diameter, the central part of which has broken down into an abscess-cavity. The vas deferens is slightly thickened, and its lumen is surrounded by a yellow zone.

There is no history to the specimen. In the recent state a few small tuberculous spots could be recognised in the mucous membrane of the trigone of the bladder.

2174. An enlarged cystic vesicula seminalis, together with part of the vas deferens, removed by operation, in section. The enlarged vesicula measures 7 cm. in length and 4 cm. in breadth; the surface is lobulated; the section displays several intercommunicating cavities lined with a smooth membrane and separated one from another by dense fibrous septa, having a thickness of 2 to 3 mm. On the posterior aspect a separate lobule of the vesicula presents an aperture 8 mm. in diameter, which indicates the position at which the vesicula was divided in removing it. Attached to the lower extremity of the vesicula is a part of the vas 4·5 cm. in length; it is irregularly dilated, and presents at its central part an external diameter of 8 mm. The wall of the vas is considerably thickened and its lumen dilated. 8897

Microscopic Structure.—"The walls of the vesicula and of the vas show a chronic inflammatory thickening, with here and there small areas which take the stain badly, and appear to be breaking down. No giant-cells are to be seen anywhere, although the appearances suggest a chronic tuberculosis."

From a man, aged 29, who was admitted into U. C. H., under the care of Mr. Bucknall, Oct. 24, 1901. There was a history of gonorrhœa 18 months previously; for 5 weeks the patient had suffered from considerable increased frequency of micturition, with pain in the glans penis at the end of the act; for a fortnight there had been pain in the right buttock, passing forwards to the penis. The bladder was sounded for stone, with negative result; the urine contained a cloud of albumin; on rectal examination an irregular nodular mass, about 3 inches in length, could be felt passing upwards from the upper margin of the left half of the prostate, and moving but slightly on the wall of the bladder; the swelling was firm and tense and, at the most prominent part, fluctuated; the prostate and testicles appeared to be normal; no tubercle bacilli could be found in the urine; the temperature was normal. On Nov. 2 the abdomen was opened by a median incision below the umbilicus, and an irregularly lobulated cystic swelling was felt attached to the back of the bladder and lying to the outer side of and involving the lower part of the vas. By dividing the peritoneum over the swelling it was dissected out as low as the prostate, to which it was attached by a well-marked pedicle; the latter was ligatured and divided and the vas similarly treated. The whole mass was thus removed and the incision in the peritoneum sutured, the abdominal incision being finally closed in the usual way. In the recent state the vesicula contained a thin turbid fluid of dark brownish colour. The patient left the hospital on the 25th day after the operation; the right vesicula appeared to be somewhat enlarged; the left testicle was rather smaller than the right. (Sir Victor Horsley and Mr. Pollard's *Case-books*, 1901, vol. ii, p. 187.)

DISEASES OF THE PROSTATE.

Prostatic Abscess.

Acute inflammation of the prostate, sometimes terminating in abscess, most commonly occurs as a complication of gonorrhœa (2175). Prostatic abscess may also occur as a complication of stricture of the urethra or its operative treatment (2085); it has also followed lithotrity. Pyæmic abscess of the prostate is very rare. A prostatic abscess usually discharges itself into the urethra, but it may point in the perineum or open into the rectum.

2175. Part of a penis with the prostate gland and adjoining portion of the bladder, the urethra being exposed from above. In the left lobe of the prostate there is an irregularly saccular abscess 2·5 cm. in diameter. 4 cm. from the anterior end of the portion of penis preserved there is a ragged opening in the floor of the urethra, which leads to an abscess in the corpus spongiosum. The wall of the abscess extends around the right side of, and for a short distance above, the corpus spongiosum, and forwards to the end of the specimen; the bulb is considerably swollen. The bladder appears to have been fairly healthy. 3613

From a man, who was admitted into U. C. H. in April 1845. Three months before admission he had severe gonorrhœa, which was followed by hæmaturia and pain in the loins. After his admission typhoid symptoms came on, accompanied with delirium. The penis was enlarged, and a bloody discharge flowed from the urethra. Mr. Quain made an opening into the corpus spongiosum and let out a quantity of pus and blood. The patient became comatose and died two days afterwards. After death small abscesses were found in the brain. (See 'Lancet,' April 25th, 1846.)

Chronic Enlargement of the Prostate.

The normal adult prostate resembles a chestnut in size and shape. It is traversed from base to apex by the prostatic portion of the urethra, into the posterior wall of which the common ejaculatory ducts open after passing through the posterior part of the gland. The part of the prostate which lies beneath the apex of the trigone, behind the upper part of the prostatic urethra and above the ejaculatory ducts, although not anatomically distinct from the rest of the gland, is often described as the middle lobe. The prostate is composed of glandular tissue, plain muscular tissue, and fibrous tissue; in the cortical layers the glandular tissue is wanting.

Around the prostate is a sheath derived from the recto-vesical fascia, and between the sheath and the surface of the gland is the prostatic plexus of veins.

After the age of 50 some degree of enlargement of the prostate gland is extremely common. Although varying somewhat in different cases, the enlargement usually occurs in the following way:—Small whitish nodules develop in the substance of the gland and gradually enlarge into considerable, closely-packed, circumscribed masses. Microscopically these growths are usually found to consist largely of glandular tissue, and the enlargement is therefore spoken of as adenomatous. As the enlargement increases, the superficial parts of the glandular tissue are compressed, and, together with the non-glandular cortex, form a dense layer surrounding the adenomata (2176). This change, although often affecting the whole gland, may be limited to, or most marked in, certain parts. Thus, for instance, without any considerable enlargement of the gland as a whole, an adenomatous growth in the so-called middle lobe may project into the bladder as a tumour of considerable size.

The most important effect produced by the enlarged prostate is the interference which it causes with the act of micturition. The part of the gland which projects into the bladder, usually behind the urethra, frequently acts as a valvular obstruction to the urethral orifice, and thus prevents the bladder from completely expelling its contents (2178, 2184). According to the degree of such obstruction, a varying amount of residual urine is left in the bladder at the end of the act of micturition, and can only be withdrawn by the passage of a catheter. As the prostatic enlargement increases, the amount of residual urine also becomes greater and the bladder proportionately dilated (2179, 2180). There is usually but little hypertrophy of the bladder-wall, for on account of the valvular nature of the obstruction nothing is gained by a forcible contraction. In the later stages the effect of increased pressure in the ureters and kidneys becomes well-marked; some degree of chronic cystitis is usually present (2178); this, together with the fact that the bladder is never completely emptied, renders the occurrence of acute cystitis very common.

The prostatic portion of the urethra is necessarily increased in length; it is often very tortuous, and may be displaced considerably to one side of the middle line by the unequal enlargement of the two sides of the gland: its actual capacity is often greatly increased (2182, 2184). These facts explain the readiness with which a soft instrument of large size can usually be passed into the bladder and the damage which may be done by the careless use of metal instruments (2178, 2181, 2183).

Chronic enlargement of the prostate is not uncommonly complicated by the formation of a calculus in the bladder; the stone is usually phosphatic, and, should it lie in the pouch which is often present behind the prostate, may be productive of but few symptoms (2185).

Experience has shown that nearly the whole of the enlarged prostate gland may with safety be removed through an incision in the overlying bladder-wall after opening the bladder above the pubes. The enucleation takes place through the condensed outer layers of the enlarged gland, and is thus unattended with injury to the prostatic venous plexus or fascial sheath (2186 A). Isolated adenomatous masses can also be enucleated from the substance of the gland.

2176. An enlarged prostate in horizontal section. It measures 5·5 cm. vertically and transversely and 4 cm. from before back. The anterior surface is convex and the posterior marked by a shallow vertical sulcus, the general shape of the normal gland being maintained. The section displays the following points:—The whole gland is surrounded by a thick fibrous capsule, which, passing inwards, divides the gland into two lateral parts, of which the left is much the larger; between the two lobes and rather nearer the anterior than the posterior surface is the urethra, which measures 12 mm. in its antero-posterior diameter; each lobe is subdivided by fibrous septa into irregular areas presenting a granular or in parts finely fascicular structure. On the upper surface of the gland a rounded area covered with mucous membrane indicates the part which projected into the bladder;

it presents two slight prominences behind the urethral orifice, of which the right is the larger. 9240

Microscopic Structure.—The glandular tissue is very abundant.

2177. A vertical section of the lower part of a bladder and prostate gland, the latter being slightly hypertrophied. The middle lobe of the prostate is somewhat pyriform in section, and projects into the bladder behind the urethral orifice. Behind the projecting middle lobe is a distinct recess, across which passes a well-developed inter-ureteral bar. The section of the prostate displays a fibrous capsule surrounding the glandular tissue, which in parts shows slight dilatation.

The bladder is thinned and dilated. 802

This specimen illustrates the common form of prostatic enlargement, and the way in which the middle lobe causes partial retention of urine. The enlarged lobe closes the urethra as a valve, except when the neck of the bladder is considerably stretched by overdistension, in which condition urine flows until the distension is reduced; hence it is the overflow only that escapes. The specimen shows well, also, the recess formed behind the enlarged middle lobe, in which a calculus may lie and escape detection, unless sounded for with a short-beaked instrument in the reversed position.

2178. A bladder with the slightly enlarged prostate gland. The middle lobe of the latter forms a prominent, almost hemispherical projection about 2·5 cm. across its base, which must have entirely closed the urethra, except in the overdistended state of the bladder, when a passage would have existed on either side of the enlarged lobe. Three pieces of whalebone have been passed along false passages which lead from either side of the verumontanum through the base of the middle lobe, and open into the bladder immediately behind it. The bladder is dilated and hypertrophied; the mucous membrane is irregularly thickened by inflammation. 3551

2179. A bladder with the prostate gland, the former having been opened by the removal of part of its left wall.

The prostate is uniformly enlarged; its middle lobe forms a rounded mass, about the size of a filbert, which projects within the neck of the bladder behind the urethral orifice. The bladder is greatly dilated, but without having undergone any hypertrophy. & ureters dild. 793

From a dissecting-room subject.

The specimen illustrates the great dilatation of the bladder which frequently results from the valvular obstruction caused by an enlarged prostate.

2180. A bladder and prostate gland. The prostate is uniformly enlarged, its lateral lobes projecting backwards within the neck of the bladder, and extending the included portion of the urethra both in length and in depth. The middle lobe projects abruptly forwards, and has been perforated by an instrument at its summit. The bladder is thinned and greatly dilated. The ureters are not dilated. 801

2181. A bladder with the prostate gland. All parts of the prostate are hypertrophied, the prostatic urethra being increased in length and depth; the middle lobe forms a prominent bar across the neck of the bladder. The floor of the prostatic portion of the urethra and the enlarged middle lobe of the prostate have been lacerated by the use of instruments; the mucous membrane around the wounds is ulcerated and ragged. The bladder is hypertrophied, but contracted. 791

The specimen shows the injuries produced by the faulty passage of metal instruments, the beak of the instrument not having been kept sufficiently forwards in its passage beneath the pubes. The contracted condition of the bladder shows that the middle lobe of the prostate was not enlarged in such a way as seriously to obstruct the exit of urine.

2182. A bladder laid open in front, in order to display the enormously hypertrophied prostate gland, the transverse diameter of which is 9·5 cm. The latter is divisible into three distinct lobes, two lateral and one posterior. The prostatic urethra, measured along its floor from the apex of the prostate to the highest part of the middle lobe, has a length of 10·5 cm.; it forms a deep recess between the lateral lobes and above divides into a **Y**-shape, the two limbs passing between the lateral and middle lobes. The surfaces of the lobes which project into the bladder are covered with smooth mucous membrane and present numerous well-defined rounded lobules. A section of the right lobe presents a coarse vesicular structure. The bladder is dilated and hypertrophied; the left ureter, which is preserved, is not dilated. 4216

From a man who for many years had suffered from repeated and profuse attacks of hæmaturia. In the recent state the mucous membrane over the lateral lobes of the prostate was beset with delicate vascular villous processes.

2183. A bladder with the prostate gland and lower part of the rectum. The prostate is slightly enlarged in all its parts. A catheter has been driven through the base of the projecting middle lobe into the areolar tissue between the rectum and the bladder, in which an abscess has formed as a result of the injury.

The bladder is hypertrophied, but not dilated; its mucous membrane is swollen from recent inflammation. The ureters are dilated. There were four calculi in the bladder. 804

2184. The lower part of a bladder with the prostate gland and part of the sac of a large abscess which has formed behind the bladder and communicates with the urethra. All the parts of the prostate are greatly hypertrophied; the middle lobe forms a prominent pedunculated swelling of the form of, and about as large as, a fœtal kidney; it reaches upwards as far as the orifices of the ureters. By the increase of the lateral lobes the prostatic portion of the urethra has been considerably deepened, and, owing to their asymmetrical enlargement, rendered very tortuous, being directed at first to the right and afterwards towards the left of the middle line. The bladder is slightly fasciculated; the prostatic urethra is, in places, superficially ulcerated. A piece of whalebone has been passed from the urethra, between the enlarged lateral lobes, into the abscess first noticed. The cavity of the abscess is about 7 cm. in its chief diameter, and is lined with sloughy tissue. 4574

From a man, aged 70, admitted into Sir J. Erichsen's wards, Jan. 17, 1860. He had applied for treatment 12 years before, when, without having noticed any previous difficulty of micturition, he was suddenly seized with retention of urine. From that time he was subject to frequent fits of retention, bleeding, pain at the end of the penis and in the perineum; but the power of emptying the bladder was only slightly diminished, and up to the time of death a catheter drew off only 3½ oz. of urine, after voluntary micturition. A No. 8 silver catheter passed readily when depressed.

2185. A bladder in which a calculus lies behind the enlarged middle lobe of the prostate. The enlargement of the prostate is considerable, and involves the whole gland; the substance of the gland in front of the urethra is traversed by a false passage, marked by a line of discoloration. The calculus, which occupies the retro-prostatic pouch, is of a flattened quadrilateral shape, and measures transversely 2·5 cm. The bladder is not dilated nor is its wall thickened: the mucous membrane, especially in the lower part, is thickened and velvety. A short distance above the calculus and to the left of the middle line is a sacculus, completely filled by a small brownish calculus.

From a man who had several times been sounded by Sir H. Thompson with a negative result. The patient, who suffered intensely, committed suicide by taking prussic acid.

2186. Numerous large fragments of prostatic tissue removed by operation, the whole, after removal, weighing nearly 4 ounces. Most of the fragments present a distinctly lobulated structure. 6471

Microscopic Structure.—The tissue consists of a stroma of fibrous and muscular elements, with an abundance of glandular spaces lined with short columnar epithelium.

From a man, aged 87, who was under the care of Mr. Buckston Browne in 1889. Since early in 1883 the patient had passed all his urine by catheter, and occasionally suffered from painful spasms of the bladder. The bladder had been sounded three times with negative result. In March 1889 the patient was suffering from extreme irritability of the bladder, the catheter being passed every hour by day and night; the urine was loaded with blood. Suprapubic cystotomy was performed, and a large prostatic outgrowth was found to be growing from below and outside the urethral orifice; the outgrowth was removed piecemeal by means of finger and forceps; there was very little bleeding. The patient was entirely relieved by the operation, and nine weeks afterwards was able to be about; but the suprapubic opening was still kept open with a tube. (Clin. Soc. Trans. 1889, vol. xxii, p. 274.)

2186 A. An enlarged prostate gland removed by enucleation through the outer cortical part. The two halves of the gland, which were removed separately, have been sutured together and a piece of tube passed through the prostatic urethra. The greatest transverse measurement of the gland is 5 cm., and the distance from base to apex 4 cm. The specimen is composed almost entirely of a number of adenomatous masses, from which the enlargement has resulted; these adenomata appear on parts of the surface as distinct lobules, but in other parts are covered by layers of the cortex. 9513

From a man, aged 65, who was admitted into U. C. H., under the care of Mr. Godlee, Jan. 30, 1904, suffering from prostatic retention of urine. There was a history of increased frequency of micturition, with some difficulty in the act, for two years. The retention was relieved by the passage of a catheter, which was passed twice daily. On Feb. 17 suprapubic cystotomy was performed; the mucous membrane over the projecting part of the prostate was incised to the right of the urethra, and the part of the gland preserved in the specimen was readily enucleated with the finger, in two separate halves. A drainage-tube was kept in the opening into the bladder for 5 days; a small quantity of urine was passed *per urethram* on the 14th day, and after this in increasing quantities. The patient left the hospital on the 31st day; the suprapubic wound had healed, and urine was passed naturally about every 4 hours. (Mr. Godlee's *Case-books*, 1904, Holden.)

2187. Part of the left lobe of a prostate gland removed by operation. It measures 5 cm. by 4 cm. in its two chief diameters and is of an irregular, flattened, ovoid form. At the upper part of the specimen two lobes which projected into the bladder are covered with mucous membrane. The surface of the rest of the specimen is irregular. 9483

Microscopic Structure.—The glandular tissue is abundant and forms large, irregular, branching spaces lined with a thick layer of spheroidal cells. The stroma is fibro-muscular.

From an elderly man, who was admitted into U. C. H., under the care of Mr. Raymond Johnson, in 1903. There was a history of difficulty of micturition, and on admission there was constant dribbling from the distended bladder, which necessitated the regular use of a catheter. On rectal examination the prostate was found to be enlarged. The bladder was opened above the pubes, and it was found that the enlargement was entirely limited to the left half of the prostate, the left lobe projecting into the bladder as a smooth lobulated prominence. An incision was made through the mucous membrane covering the projecting part of the prostate, and by introducing the finger through this the greater part of the left lobe was readily enucleated, the gland being pushed up by means of the left index-finger introduced into the rectum; there was very little hæmorrhage. A drainage-tube was retained in the suprapubic wound for about a week. When the patient left the hospital there was complete recovery of voluntary micturition and there was no residual urine. (Mr. Godlee's *Case-books*, 1903.)

Prostatic Calculi.

The nuclei of prostatic calculi are formed by the small albuminoid concretions which normally are present in the glandular follicles and escape with the secretion. Should these concretions be retained and become encrusted with calcium salts, chiefly phosphate and carbonate, prostatic calculi are formed. As they increase in size the gland-structure becomes absorbed, and finally they lie encapsuled in small cavities surrounded by fibroid tissue (2189, 2191). Several such cavities may coalesce, and the stones thus come into contact one with another. When single and lying in a distinct cavity a prostatic calculus is round and may reach the size of a pea. When several have come in contact they assume, as they increase in size, a polygonal form. When a prostatic calculus lies immediately beneath the mucous membrane of the urethra, it may at last ulcerate through and be discharged with the urine. Prostatic calculi may usually be distinguished from urinary calculi which have lodged in the prostate by their small size, rounded form, and dark surface, and, chemically, by the absence of urates, oxalates, or ammonio-magnesic phosphate.

2188. A prostate with the lower part of the bladder. An incision has been made into the right lobe of the prostate to display two small pale yellow calculi which have been formed in dilated ducts of the gland. Much of the vesical mucous membrane has been destroyed by ulceration, the muscular fasciculi being exposed. 3844

2189. A bladder with the prostate gland and part of the urethra, laid open. The bladder is hypertrophied and fasciculated; the mucous membrane is thickened; there is a sacculus as large as a small walnut communicating with the bladder 2·5 cm. above the orifice of the right ureter. The prostate is enlarged; parts of the lateral and middle lobes have been removed in order to expose a large irregular cavity in the substance of the gland; the cavity, which was occupied by the calculi preserved in No. 2190, is divided into communicating loculi by delicate septa. The urethra is strictured in the bulbous portion. 6357

2190. The calculi removed from the prostate preserved in the preceding specimen. They vary in size from a millet-seed to a stone of the diameter of over 1 cm.; they are polished, pale yellowish brown in colour, and, excepting the most minute, irregularly facetted. 6357

From a man, aged 48, who was admitted into U. C. H. in 1888. Four years previously external urethrotomy had been performed and abscesses in the scrotum opened. For 11 months the patient had been wasting, and the urine contained pus and occasionally blood; for 6 months there had been pain in the left loin and frequent painful micturition. On admission the prostate was enlarged and tender; the urine was ammoniacal and contained pus and blood; the bladder was sounded with negative result. The urethral stricture was dilated. Death occurred on the 17th day; during the preceding 5 days there had been diarrhœa, vomiting, subnormal temperature, and the passage of darkly blood-stained urine. At the *post mortem* examination the left kidney was found to contain a large branched calculus and to be the seat of suppurative nephritis; the right kidney was atrophied and dilated, its pelvis containing a small calculus. The right lung contained old and recent tubercle. (Surg. Reg. Rep. 1888, p. 66.)

2191. A prostate, together with a part of the bladder. Parts of the lateral lobes of the prostate have been removed in order to expose numerous small dark brown calculi which are embedded in the substance of the gland. The stones lie in an irregular loculated cavity, subdivided by fibrous septa. The bladder is fasciculated: on the left side, 4 cm. above the ureteral orifice, is a sacculus, completely filled by an orange-red calculus of uric acid; the mucous membrane around the neck of the sacculus is superficially ulcerated. 1640

2192. Prostatic calculi passed by the urethra. Except in the case of the two smallest, all the stones are more or less facetted and grey in colour. Those which have been divided present a laminated structure. 3406

Tuberculous Disease of the Prostate.

Tuberculous disease of the prostate is not uncommonly met with, but the disease is scarcely ever limited to the gland alone; it almost invariably forms a part of extensive tuberculous disease affecting either the testicle, vas deferens and prostate, or the kidney, ureter, bladder, and prostate, or, in very rare cases, all these together. The disease is characterised by opaque, yellow, caseous masses, situated in the glandular part of the prostate, usually towards the lower part of the lateral lobes and the floor of the urethra (2193). The caseous masses soften and break down in the centre, and, finally, the mucous membrane over them gives way, and ragged excavated cavities are left, communicating with the urethra. The gland is enlarged, and its surface nodular and irregular; around the tuberculous nodules it is more or less indurated. The vesiculæ seminales are usually at the same time affected. Occasionally an abscess may form at the under surface and burst into the rectum, leaving a fistula; but this is rare.

2193. The lower part of a bladder, together with the prostate, vesiculæ seminales, and membranous portion of the urethra. The prostate is considerably enlarged, and a section through the left lobe shows the gland to be infiltrated by small, dense, caseous deposits, surrounded by fibrous septa. The left vesicula seminalis is surrounded by indurated fibro-fatty tissue; the right, which has been displayed by dissection, is slightly enlarged. The vasa deferentia are thickened at their terminations. The mucous membrane of the trigone and neck of the bladder is raised into a slightly nodular prominence by the extension of the disease from the prostate into the submucous tissue. The mucous membrane of the remaining part of the bladder is healthy. 2109

2194. A bladder with the prostate gland and a part of the rectum. The bladder is dilated with slight hypertrophy of its walls. Its mucous membrane is, in parts, ragged and ulcerated, the muscular fibres being exposed. The prostate is almost entirely destroyed by an abscess, the cavity of which is almost as large as that of the bladder itself. Between the abscess and the bladder there is a thin imperfect septum, formed by the mucous membrane of the trigone. Between this and the membranous portion of the urethra is a large rounded opening 3·5 cm. in diameter, leading into the abscess-cavity. The mucous membrane of the urethra ends abruptly in a ragged margin at the lower edge of this opening. The vesiculæ seminales cannot be recognised, but are apparently involved in the cavity of the abscess which has resulted from the softening and disintegration of a tuberculous mass involving them with the prostate. The ureters are both dilated. The mucous membrane of the left is healthy; the walls of the right are much thickened, and its mucous membrane is replaced by a layer of yellow cheesy substance, which extends to the vesical orifice, around which the mucous membrane is ragged and ulcerated. There is irregular ulceration in the lower part of the rectum.

From a man, aged 23, who was admitted into U. C. H. in 1881; he had suffered for seven months from frequency of micturition, ending in constant dribbling of urine for the last four months. Five months before admission he passed a small calculus about the size of a pea. For the first three months he had pain across the loins; during the last three the pain had been in the lower part of the body or at the end of the penis during micturition. The urine had been constantly bloody for the last three months; on admission it was alkaline, sp. gr. 1025, and contained pus and blood. There was no evidence of stricture or stone; the prostate was enlarged, not hard nor tender. The bladder was found to contain a pint of offensive urine; it was washed out daily. There was a tuberculous abscess of the right testicle. The temperature was irregular, varying from normal to 102° F. Death occurred rather suddenly on the 25th day in hospital. At the *post mortem* examination tuberculous disease was found in the lungs, the right kidney, right testicle, and small intestine.

Tumours of the Prostate.

Adenoma.—The circumscribed glandular growths found in the chronically enlarged prostate have already been described. Occasionally a single tumour of similar characters is met with in a prostate gland which is not the seat of a general enlargement.

Carcinoma of the prostate is rare as a primary disease; the gland is, however frequently implicated by extension of columnar carcinoma from the rectum or squamous carcinoma from the bladder. Primary carcinoma of the prostate originates in the glandular tissue and is of the spheroidal-cell variety. It has a special tendency to cause secondary deposits in the bones.

In No. 2195 the growth has undergone colloid degeneration.

Sarcoma of the prostate is extremely rare.

2195. A bladder and prostate gland in section, the latter being the seat of a new growth. The prostate forms a mass nearly equal in size to the contracted bladder; it measures 5 cm. from before backwards, and 4·5 cm. from above downwards, and externally the distinction between it and the bladder is clearly marked. The section shows that the enlargement of the prostate is due to its infiltration by a tumour which also implicates the adjoining part of the wall of the bladder, extending backwards to the orifices of the ureters, and upwards for 3 cm. The surface of the section of the growth shows a reticulate stroma, the meshes of which are clearly visible to the naked eye, and are filled with a semitransparent colloid material. The prostatic urethra is narrow at each end, and in the middle forms a space 2 cm. in diameter. The mucous membrane is destroyed by ulceration over the tumour, both within the bladder and in the prostatic portion of the urethra. The mucous membrane of the rest of the bladder is thickened and irregular from chronic inflammation; the muscular coat is slightly hypertrophied. Both ureters are dilated and their walls thickened. The vesiculæ seminales are infiltrated by colloid new growth.

Microscopic Structure.—The growth is a spheroidal-cell carcinoma, which in almost all parts has undergone colloid change.

From a man, aged 59, a groom, who had good health up to July 1880; he was then seized with retention whilst at work. His urine was drawn off at St. Mary's Hospital; it was thick and dark-coloured, and remained so. After this frequency of micturition increased, especially in the daytime, and in a few days he passed blood in his urine.

In August he passed a small stone, and his urine was almost always bloody, the blood coming chiefly at the end of micturition.

From August to October eight or nine small stones were passed. On Oct. 28 retention again supervened and he was taken into St. Mary's Hospital, and a stone, impacted in the urethra, was pushed back into the bladder. Two small stones were passed during the night, and a few more during the next twelve weeks, which he spent in hospital. Three or four large "pieces of flesh" were also passed. His bladder was found rough, but no stone was ever struck.

Three weeks after leaving St. Mary's he was admitted into St. Peter's Hospital, under Mr. Coulson (Feb. 10, 1881), and gave the above history. He was not emaciated, but had been losing flesh for a year. He had no stricture; micturition was very frequent—sometimes every hour; stream occasionally full, but, as a rule, small, and retention from impaction of slough in the urethra was not uncommon. There was often painful straining during micturition, and dull suprapubic pain running to end of penis and shooting pain in the rectum, especially at night, were frequently noted. The urine was ammoniacal and constantly bloody.

The prostate was much enlarged, smooth, hard, not tender. A catheter sometimes hitched in the prostate, and was once pushed on through soft breaking-down tissue.

Vomiting began on March 1, and towards the end was almost constant; the urine became more bloody, and for the last three or four days was scanty and dribbled away: painful straining continued, and the patient became rapidly weaker. On the night of the 26th he had a sudden attack of dyspnœa, and died very quickly. (Boyd, Trans. Path. Soc. vol. xxxiii, 1882, p. 200.)

2196. A section of the bladder, prostate, and part of the rectum, to the left of the middle line, the prostate being extensively invaded by a new growth. The prostate is considerably enlarged, and on section is seen to be invaded at all parts by an opaque yellowish-white growth, in the central part of which are numerous dark spots formed by prostatic concretions. Posteriorly the growth surrounds the vesiculæ and extends backwards as a considerable mass beneath the floor of the recto-vesical pouch. There is a secondary deposit of the growth in the glands around the left common iliac artery. The bladder is contracted and contains a uric-acid calculus; the mucous membrane is thickened and roughened by chronic inflammation; the muscular coat is hypertrophied and fibroid. 8521

Microscopic Structure.—The tumour is a spheroidal-cell carcinoma, with an abundant stroma.

From a man, aged 61, who was admitted into U. C. H., under the care of Sir Victor Horsley, in 1900. At the beginning of 1899 the patient first experienced difficulty and increased frequency in micturition. On admission the patient was wasted; the bladder was distended and the urine, which was alkaline and contained blood and pus, constantly dribbled away; the prostate as felt from the rectum was considerably and irregularly enlarged, and extremely hard. The bladder was emptied by catheter and washed out. Two days after admission the patient became delirious; there was dyspnœa with muscular twitchings of the limbs. On the 9th day the patient became comatose and died 12 days after admission. (Surg. Reg. Rep. 1900, p. 192, No. 1008.)

2197. The right half of a bladder and prostate, together with the adjacent part of the rectum, the prostate being the seat of an extensive new growth. The normal outline of the prostate is lost as the result of the extension of the growth from the gland into the surrounding tissues. Thus, upwards it extends between the bladder and rectum to the floor of the recto-vesical pouch, which is raised considerably above its natural level and presents, when viewed from above, a smooth nodular projection of the growth beneath the peritoneum. Posteriorly the growth is limited by the muscular coat of the rectum, except below, where it forms a considerable nodular projection into the bowel, and at one spot has extended through the muscular coat into the submucous tissue. Anteriorly the growth completely surrounds the prostatic urethra, the lumen of which does not, however, appear to be diminished. The bladder is not hypertrophied. The cut surface of the tumour presents a dense fibrous structure in the position of the prostate gland itself, but the extensions of the growth beyond this are softer and more homogeneous. 7546

Microscopic Structure.—The growth is a spheroidal-cell carcinoma.

There is no history to the specimen.

2198. The left half of a large malignant tumour of the prostate, together with a small adjacent piece of the bladder. The antero-posterior measurement of the tumour is 9 cm., and the cut surface presents a coarse fibrous reticulum the meshes of which are filled with soft granular tumour-substance, the central part having broken down. Posteriorly the growth extends beneath the peritoneum of the recto-vesical pouch. In the upper and front part of the tumour the course of the urethra can be traced, and near the urethral orifice a nodular extension of the growth projects into the bladder. 6507

Microscopic Structure.—The tumour is a carcinoma. The alveoli are large and separated by slender trabeculæ; the epithelium-cells are mostly spheroidal or polygonal, but in some of the alveoli the outermost cells are distinctly cubical.

From a man who was under the care of Mr. Buckston Browne. The bladder had been drained above the pubes for 6 months before death.

2199. A bladder and prostate, together with the kidneys and ureters, the bladder and prostate being extensively invaded by a new growth. The prostate is moderately enlarged, and from it the new growth extends as a considerable thickening into the adjacent part of the bladder-wall, which presents in its inner aspect an irregular shaggy surface. The bladder is contracted, and at its summit the wall is extremely thin; in this position a piece of large intestine is firmly adherent to the bladder by two of its appendices epiploicæ. The pelvis and calices of the right kidney are much dilated and the pelvis of the left is similarly, but more markedly, affected; both ureters are also dilated. 6394

Microscopic Structure.—The tumour is a carcinoma. The cell-masses are small and the cells flattened; there are a few cell-nests. It is probable that the tumour originated in the mucous membrane of the bladder.

From a man, aged 64, who came from Teneriffe, to be under the care of Mr. Berkeley Hill, in Oct. 1888. There was a long history of gravel, and for 12 months the patient had suffered from incontinence of urine and hæmaturia. On Sept. 29, 1888, there was almost complete suppression of urine. On Oct. 5 hot-air baths and jaborandi were ordered; in the following 24 hours only two drachms of bloody urine were passed. On Oct. 8 the patient was examined under an anæsthetic; a few drachms of urine were withdrawn by a catheter; on rectal examination a hard nodule was felt on the right side of the prostate. Death occurred suddenly on Oct. 9; there were no convulsions or twitchings, and no fever or vomiting.

Cysts in Connexion with the Prostate.

The nature of the cysts shown in No. 2200 is uncertain. They are clearly connected with the prostate gland.

2200. The lower part of a bladder with the prostate gland and adjoining portion of the urethra. In its bulbous part the urethra is narrowed by a stricture so as to admit scarcely more than the bristle which is passed through it. Behind the stricture the membranous and prostatic portions of the urethra are dilated. The prostate gland is slightly enlarged.

On the under surface of the prostate on each side, reaching backwards to the vesiculæ seminales and forwards to the apex of the gland, is a cyst about 3 cm. in diameter; the cysts have a firm fibrous wall with a soft flocculent lining. Both ejaculatory ducts are pervious, and fluid injected either by the vesiculæ seminales or vasa deferentia passed readily from the urethra, without entering the cysts. 799

DISEASES OF THE PENIS.

Phimosis.

Phimosis is narrowing of the orifice of the prepuce to such an extent as to render it incapable of being easily drawn backward so as fully to expose the glans penis. It is most commonly a congenital malformation, and the inner layer of the prepuce is then often adherent to the surface of the glans. Phimosis may also be acquired as the result of shrinking of the orifice of the prepuce; this may be due to the contraction of the cicatrices of venereal sores or to repeated attacks of inflammation of the prepuce (posthitis) resulting from gonorrhœa, want of cleanliness or herpes præputialis. In elderly men phimosis may occur as a result of gouty inflammation of the part.

As a result of phimosis the accumulated smegma may cause attacks of inflammation of the glans and prepuce, and in rare instances may, together with phosphates from the urine, form a calculous concretion. In cases of extreme phimosis the obstruction to the escape of urine may give rise to all the symptoms and pathological consequences of stricture of the urethra. Neglected phimosis is believed to predispose to the development of warty growths and carcinoma.

2201. Part of the prepuce of a boy, which was removed for congenital phimosis. The natural aperture is so small as only to admit a bristle. 2187

2202. Part of the penis of an adult in whom phimosis had existed since birth. The prepuce has been slit up after death, through the left side. The dorsal surface of the glans penis is rough and shreddy, and the corresponding portion of the inner surface of the prepuce presents similar characters, showing that adhesions between them have been forcibly separated. A piece of full-sized bougie has been passed into the urethra. 3572

It is stated in the MS. catalogue that the patient died of malignant disease of the groin.

Hypertrophy of Skin of Penis.

In true elephantiasis the superficial tissues of the penis are involved in association with those of the scrotum. In other cases the hypertrophy is usually the result of obstruction of the lymphatics following inflammation of the part.

2203. The greatly hypertrophied prepuce and part of the skin of the body of the penis, removed by operation, and laid open dorsally. The increase in size is chiefly the result of a general overgrowth of the subcutaneous tissue. The surface of the skin is coarsely warty and furrowed; it is of a pale brown colour, except some of the most prominent papillæ which are nearly white. On the left side there is a group of radiating ridges in the skin, which look as if they had been produced by the shrinking of a cicatrix. 5605

From a man, aged 38, who had always resided in England. He had had two or three attacks of gonorrhœa; enlargement of the scrotum began 6 years before admission, that of the penis was of 3 years duration; the glands in both groins were enlarged. (Surg. Reg. Rep. 1881, p. 37, No. 130.)

Tumours of the Penis.

Fibroma.—Two specimens are here shown of fibroma of the penis (2204, 2205). In both cases the tumour appears to have sprung from the fibrous tissue of the corpora cavernosa close to the corona. The tumours are dense and hard, composed of almost pure white fibrous tissue, and attached by a wide base to the fibrous structures. The surface is round and irregularly nodular.

Papilloma.—Warts are of common occurrence under a long prepuce. They may arise merely from want of cleanliness, or may be due to the irritation of venereal discharges. They may reach a large size with great rapidity, assuming the ordinary cauliflower form of such growths, and the prepuce may become so greatly distended that its retraction is no longer possible. They most commonly spring from the corona near the frenum. After middle life they have a great tendency to become malignant (2206–2208).

Squamous carcinoma.—Carcinoma of the penis is of frequent occurrence after middle life, and is not uncommonly associated with some degree of phimosis (2212). The disease commences most commonly in the corona, but it may begin in the prepuce; it is rare in the skin covering the body of the penis. The disease most commonly assumes a papillary form (2211), and is then distinguished from a simple warty growth by the indurated base, the less branching appearance of its papillæ and frequently by the ulceration of its central part. In other cases the disease commences as an indurated ulcer resembling a carcinoma of the lip or tongue; it may then be mistaken for a venereal sore. As the disease extends it may finally perforate the whole thickness of the prepuce, and through an opening in the latter the diseased glans may project (2211). The disease may extend widely in the cavernous tissue of the penis. Secondary deposits in the lymphatic glands of the groin are common.

2204. The glans and adjoining part of a penis removed by operation. On the left side and lower surface of the penis, close behind the glans, there is a firm lobulated fibroma. The tumour projects about 4 cm. beyond the surface around, and is unconnected with the skin except over one of its lobules where the skin is ulcerated.

The new growth is firmly connected with the fibrous wall of the corpora cavernosa, from which it has probably grown. The divided surface displays white fibrous tissue, arranged concentrically around numerous points, as is commonly seen in dense fibromata. At the base of the tumour, at the lower aspect and near the glans, is a small warty growth attached by a broad base to the integument. 5419

Microscopic Structure.—The tumour is a pure fibroma.

From a man, aged 56, who was admitted into U. C. H., under the care of Sir J. E. Erichsen, on November 2, 1872. Thirty-three years ago he had a chancre followed by no constitutional symptoms. Thirteen years ago a growth like a wart formed beneath the prepuce close to the base of the glans. This reached the size of a walnut. Eleven years ago he was circumcised, and the growth was removed. Two years after (nine years ago) the tumour began to grow again in the scar, and continued to increase slowly till six months before admission, when its progress became more rapid. It had not interfered with micturition or caused pain. On admission the patient was a healthy-looking man. On the left side of the penis, immediately below the glans, was a tumour about the size of a hen's egg, irregular and nodular in shape. The base of the tumour almost surrounded the penis. It was of stony hardness and perfectly free from tenderness; the skin was movable over it everywhere except at the lowest part, where it was adherent and ulcerating. The penis was amputated and the patient made a rapid recovery. On dissection after removal, it was found impossible to separate the growth from the corpus spongiosum or from the left corpus cavernosum. The tumour seemed to have arisen from the corpus cavernosum.

(The case has been incorrectly quoted, in Klebs's 'Handbuch der pathologischen Anatomie,' as a case of fibroma of the prepuce.)

2205. The glans and adjoining part of a penis removed by operation for a fibrous tumour. The skin has been divided along the dorsum and reflected from the surface of part of the tumour. The tumour, which appears to have originated in the region of the corona, involves the glans except at its extremity and the adjacent part of the body of the penis; it is irregularly lobulated and projects most prominently on the left side inferiorly, where a large lobule of the growth is covered by firmly adherent skin. The cut surface of the tumour is dense, white and slightly fibrillated. 4997

Microscopic Structure.—The growth is composed of interlacing bundles of white fibrous tissue.

From a patient under the care of Mr. Quain. The specimen is described in the MS. catalogue as "cancerous enlargement of the glans penis."

2206. A long prepuce removed by operation for papillomata. There are two tumours, the larger of which springs from the free edge of the prepuce and the smaller from within the edge. Each tumour is composed of a mass of closely-packed papillary processes. 9484

2207. A small papilloma with an elliptical piece of skin, removed from the penis. The growth is composed of closely-packed club-shaped papillæ radiating from a narrow base of attachment. 2344

2208. Part of the penis of an adult, imperfectly injected, and the urethra laid open dorsally. The glans and prepuce are completely covered by a papillary growth. The section of the glans shows that in this situation the papillæ form a regular layer, about 4 mm. in thickness, the deeper surface of the growth being separated by a very regular line from the cavernous tissue. On the prepuce, both surfaces of which are involved by the growth, the papillæ are much larger and more irregular and, around the margin, overhang the surrounding skin. The section of this part also shows that the growth appears to be entirely superficial. 2686

Microscopic Structure.—The tumour is a simple papilloma.

2209. Part of a penis removed by operation for carcinoma and divided by a mesial section immediately to the left of the middle line; the prepuce had been previously removed. The tumour forms a rounded mass 3 cm. in diameter on the under surface of the penis, immediately behind the glans. The skin which covers the growth presents a finely warty surface, except behind the corona to the left of the frenum, where there is a deep ulcer. On the divided surface of the specimen the growth is seen to extend upwards to the floor of the urethra. 5916

From a patient under the care of Mr. Heath.

2210. The left half of part of a penis the prepuce of which had been previously removed by circumcision. From the dorsal surface of the glans and the adjoining portion of the body of the penis, for the distance of about 5 cm., a prominent carcinomatous tumour has grown. The tumour is cleft and subdivided, so as to present a cauliflower-like surface, and its edges are overhanging; its section shows it to be constructed of long branching papillæ. The growth appears to have invaded the subjacent structures, and there is an extensive cavity in the ends of the corpora cavernosa, probably due to the degenerative softening of part of the ingrowing tumour. 2283

2211. Part of a penis removed by operation for carcinoma of the glans. The tumour, which has a remarkably cauliflower-like appearance, has led to ulceration of the upper part of the prepuce, through which both the tumour and the glans penis project. A bristle has been passed through the middle of the mass into the urethra. 4059

From a patient under the care of Mr. Quain.

2212. Part of a penis removed by operation for carcinoma of the glans. The prepuce, which is very œdematous, has been laid open dorsally, in order to display the tumour. The latter involves the whole of the right half of the glans, extending up to within 6 mm. of the meatus. The surface of the growth is covered with club-shaped, branched papillæ, flattened and compressed by the prepuce which was stretched over them. The edge of the growth is overhanging. 8304

Microscopic Structure.—The growth consists of large irregular papillæ covered with a thick layer of stratified epithelium. At the base of the growth the tissues are inflamed and the epithelium irregular, but no definite downgrowth was seen in the part examined.

From a man, aged 52, who was admitted into U. C. H., under the care of Mr. Raymond Johnson, in 1899. The disease was of 18 months duration. The extremity of the penis was greatly enlarged, chiefly as the result of œdema of the prepuce, which could not be retracted. On the right side of the penis about the level of the corona there were two sinuses in the prepuce, from which thin pus escaped. Through the prepuce a hard irregular mass could be felt. The diagnosis of carcinoma having been confirmed by laying open the prepuce along the dorsum, the penis was amputated well behind the disease. (Surg. Reg. Rep. 1899, p. 250.)

2213. A penis, together with the adjacent part of the scrotum, removed by operation for an extensive carcinomatous tumour. At the anterior extremity of the specimen the end of the glans and the lower part of the œdematous pigmented prepuce can be recognised. In the whole of the rest of its extent the penis is hidden by an extensive carcinomatous tumour which has spread backwards so as to involve the neighbouring part of the scrotum. The antero-posterior measurement of the tumour is 8 cm., and the vertical measurement in its posterior part 9 cm. The surface of the growth is at all parts divided by deep clefts into irregular curling lobules, the surface of which is in some parts coarsely warty and in others composed of closely-packed, club-shaped papillary projections. Posteriorly, where the growth is spreading in the skin of the scrotum, the edge is irregular, raised and overhanging. 6914

From a man aged 50, who was admitted into U. C. H. under the care of Mr. Heath, Oct. 15, 1892. There was no history of venereal disease. The growth had commenced two years ago after a fall in which the skin of the penis and scrotum was bruised. A year before admission part of the growth had been cut away. The parts preserved in the specimen were removed by operation, chiefly with the cautery; the penis was divided far back with a bistoury, the corpus spongiosum being divided obliquely slightly in front of the corpora cavernosa, and the urethra sutured to an opening made in the scrotal flap. Both testicles were removed and also some slightly enlarged glands from both groins from the same wound. The patient left the hospital on Nov. 21. (Mr. Heath's *Case-Books*, 1892, vol. ii, p. 283.)

DISEASES OF THE BREAST.

The diseases of the male and female breast are grouped together in this section. The male breast is much less frequently affected than the female; but there is no pathological difference between the diseases occurring in the two sexes.

ATROPHY.

Atrophy of the mammary gland occurs as a normal process after the menopause. Owing to the increase of fat in the mammary region, the breast may retain its normal size or even apparently become larger at the same time that atrophy of the gland-tissue is taking place. Microscopic examination of an atrophied breast shows that the change is limited to the acini. The epithelium disappears and the walls fall together. In some cases small cysts form in the gland (involution-cysts). In the breasts of very old women no trace of the acini may be found. The ducts remain unchanged, except that the epithelium is often somewhat shrunken and granular. In some of the specimens of carcinoma of the breast no trace of gland-tissue is visible, but the remains of the ducts can be seen passing into the tumour.

HYPERTROPHY.

True hypertrophy of the breast is a rare disease. It is met with chiefly in young girls about puberty. The breasts have been known to reach an enormous size, resting on the thighs when the patient was in a sitting position. In the few cases which have been examined microscopically all the normal structures of the gland have been found to be increased in quantity, especially the inter-acinous fibrous tissue.

ACUTE INFLAMMATION OF THE BREAST.

Acute inflammation of the breast is commonly met with during lactation and frequently terminates in suppuration. It is very rare in the adult, apart from pregnancy, but occasionally occurs in infants and at puberty in either sex.

CHRONIC INFLAMMATION OF THE BREAST. CHRONIC INTERSTITIAL MASTITIS.

Chronic interstitial inflammation in rare cases affects the whole breast. It is occasionally met with in this form in the male (2215, 2216); most commonly in the female it is limited to one or more lobules. It is common in women after middle life. Microscopic examination of the diseased part shows a great increase in the interstitial connective tissue. The new fibroid tissue contains a varying number of small round or oat-shaped cells, according to its stage of development and the activity of the process. In developing into fibrous tissue the new growth contracts, as in cirrhosis of the liver or kidney. The ducts thus become compressed, and many of the acini obliterated; others, however, often become distended by a small quantity of abnormal secretion, and thus small retention-cysts are formed (2214). Sometimes, however, the cysts may reach such a size as to form obvious tumours in the gland. (*See* Cysts of the Breast, 2229.)

The chronically inflamed lobule is dense and leathery in consistence, opaque white in colour, and traversed by bands of fibrous tissue running through it in various directions. The contents of the small cysts are clear and serous or sometimes turbid and brownish in colour. The limits of the diseased part are not clearly defined.

When the whole breast is affected the appearances are similar (2214). At first the breast may be somewhat enlarged, especially in the male, but ultimately it shrinks. Chronic interstitial mastitis derives its chief importance from the close clinical resemblance it may bear to hard carcinoma.

2214. A breast removed for chronic interstitial inflammation; the nipple with a very small piece of skin is attached. The breast is flat and thin, and surrounded by scarcely any fat. Numerous incisions have been made into its under surface. The substance of the gland is opaque and traversed by bands of fibrous tissue running in various directions. Small retention-cysts are scattered through its substance; several of these are marked by pieces of red glass close to them. 5726

From a woman, aged 40, who was admitted into U. C. H. under the care of Mr. Beck, January 17, 1882. The right breast had been removed for cancer 5 months previously. Immediately after the operation the left breast began to be painful, and caused great annoyance. On admission the breast was slightly larger than natural; it was indurated and knotty. It was not very tender when handled, but was the seat of much pain. As the patient was unmarried and treatment produced no effect, the breast was removed, the diagnosis of chronic interstitial mastitis with small retention-cysts having been made. Subsequently two small nodules of growth were removed from near the scar in the right mammary region. (Mr. Marshall's *Case-books*, 1882, vol. i, p. 368.)

2215. A male breast with the nipple and surrounding skin, removed for chronic inflammation. The nipple and skin are unaltered. The breast is circular and measures 8 cm. in diameter, but not more than 1·5 cm. in thickness. There is little fat, the mass seeming to be composed chiefly of excessively dense fibrous tissue.

Microscopic Structure.—A section shows a very dense and abundant fibrous stroma in which are scattered groups of acini and a few ducts, some of which are slightly dilated.

2216. A male breast, together with an elliptical piece of skin, including the nipple and some of the surrounding fat, removed by operation for chronic mastitis. The nipple is retracted, and an incision which has been made into the breast from its deep surface shows the gland-tissue to be fibroid and indurated. 9117

Microscopic Structure.—The fibrous tissue of the breast is abundant, loose and rich in cell-elements. The acini and ducts, which are scattered irregularly in the stroma, show considerable epithelial proliferation, which in some of the spaces takes the form of small papillary projections into the lumen.

From a man, aged 34, who was under the care of Mr. Godlee. He had complained of sharp spasmodic pain in the right breast for two months.

CHRONIC ABSCESS OF THE BREAST.

Simple Chronic Abscess of the Breast is a somewhat rare disease, and derives its importance from its clinical resemblance to carcinoma. It arises almost invariably either after delivery at full term or a miscarriage. A chronic abscess is usually of small size, and contains thick curdy pus. The cavity is lined by a thin layer of granulation-tissue, and surrounded by a considerable thickness of densely indurated mammary tissue. The shrinking of this chronically inflamed tissue may cause retraction of the nipple (2217). As the chronic inflammation extends into the fat in the immediate neighbourhood of the affected lobule of the gland the tumour, if the abscess be near the surface, may become adherent to the skin, and thus more closely resemble carcinoma. The thick walls and the small size of the cavity make it impossible to feel actual fluctuation.

2217. A breast in which is a chronic abscess which simulated carcinoma. The skin covering the gland is healthy. The breast has been divided by an incision passing through the nipple. The nipple is deeply retracted, so as to lie considerably below the level of the surrounding skin. The gland-substance is abundant, and for the most part healthy. Immediately beneath the nipple it is indurated. Its colour here is slightly greyish, and white lines of fibrous tissue can be seen traversing it in various directions. The substance of the gland is here much shrunken, the nipple being retracted and the under surface of the gland drawn forwards towards it. This is the result of the shrinking of the chronic inflammatory products in the formation of new fibrous tissue.

The cavity of the abscess is shown on the opposite half of the specimen. It is about 1 cm. in diameter, and is lined by a thin layer of granulation-tissue. At its deep part it is in contact with the fascia beneath the gland; superficially it is more than 1 cm. from the skin. The tissue around it is indurated and shrunken. It is evident that the abscess, if progressing at all, was advancing rather towards the submammary areolar tissue than towards the skin.

Microscopic Structure.—A section through the wall of the abscess-cavity does not show any evidence of tuberculous disease.

From a single woman, aged 32, who was admitted into U. C. H. under the care of Mr. Marshall, Mar. 10, 1881. Three years before she had noticed retraction of the nipple with swelling and induration of the parts around it and shooting pains in the breast. It was poulticed, and the swelling subsided. There was a tuberculous history. No cause was known for the disease, but three weeks before admission the pain returned. On admission the left nipple was deeply retracted. There was slight swelling around it, and the skin was shiny and rather red and hot; it ~~could~~ tender and hard, and beneath the nipple there was a mass of induration, about 2 inches in diameter. It could not be isolated from the surrounding parts, and there was no fluctuation. The rest of the breast seemed healthy. There were no enlarged glands. There was aching and occasional shooting pain in the breast. The patient was pale but strong, and fairly nourished. The diagnosis of cancer was made, and the breast was amputated. After removal a small abscess with dense walls surrounded by a wide zone of indurated mammary tissue was found. The patient recovered rapidly from the operation. (Mr. Marshall's *Case-Books*, 1881, vol. i, p. 310.)

The abscess was not connected with lactation or injury.

Tuberculous Disease of the Breast.

Tuberculous disease of the breast is not very rare. It usually manifests itself as a more or less circumscribed induration in the gland, which, after undergoing caseation, results in the formation of a chronic abscess (2218). If the abscess be allowed to burst spontaneously, one or more intractable sinuses leading to the indurated breast-tissue are likely to remain. In a less common form of the disease a more widely spread induration occurs, and instead of resulting in a single abscess, undergoes caseation at many separate points. Tuberculous disease of the breast may cause secondary infection of the axillary lymphatic glands, and hard cords produced by the diseased lymphatic vessels may sometimes be felt extending from the breast to the glands (2218).

Occasionally a tuberculous abscess, originating in a rib or its cartilage, extends into the substance of the breast.

2218. Part of the upper and outer quadrant of a left breast, together with some of the axillary lymphatic glands, removed for tuberculous disease. An incision made into the breast-tissue displays a small irregular abscess-cavity surrounded by indurated breast-tissue and fat. Connected with the breast by enlarged lymphatic vessels are several lymphatic glands. The largest of these, of which a section has been made, presents a number of caseous deposits separated by trabeculæ of fibrous tissue. 7033

Microscopic Structure.—A section of the wall of the abscess in the breast shows nodules containing characteristic giant-cells and epithelioid cells. The lymphatic gland examined shows typical caseous tubercles.

From a young woman, who was admitted into the Great Northern Central Hospital under the care of Mr. Raymond Johnson in 1892. There was an induration in the upper and outer part of the left breast with a small sinus in the overlying skin; the axillary glands were enlarged.

2219. A breast which is the seat of tuberculous disease, together with part of the skin covering it, divided by a section carried through the areola close to the nipple. The area of disease is in the central part of the gland and is distinguished from the surrounding opaque-white breast-tissue by its more yellow colour and greater vascularity. The appearance is due to the replacement of the gland-tissue by tuberculous granulation-tissue. The area of disease in the gland measures 3 cm. across. At the surface of the gland the disease extends into the subcutaneous fat, the contrast with which is very clear, and thence into the skin, the section passing through an ulcer nearly 2 cm. in diameter close to the nipple. The nipple itself is retracted. 9555

Microscopic Structure.—A section through the area of disease shows the typical appearances of caseating tuberculous tissue. Beyond the limit of the tuberculous deposit there is a zone in which the tissue around the glandular spaces is infiltrated with small round cells.

From a single woman, aged 22, who was under the care of Mr. Douglas Drew, in the Hospital for Women, Soho Square, in April, 1904. Ten weeks before admission the patient had sustained a blow on the right breast, and about two weeks later noticed a lump on the outer side of the nipple; the lump was slightly tender, and the nipple became retracted. After increasing in size, the lump burst, and a quantity of pus escaped, leaving an ulcer which showed no sign of healing. There were no signs of tuberculous disease elsewhere, but an enlarged gland could be felt in the right axilla. The patient had always enjoyed good health, but there was a tuberculous family history.

The breast was excised.

SYPHILITIC DISEASE OF THE BREAST.

The primary syphilitic sore is occasionally met with on the nipple or areola and mucous tubercles may occur in the same parts. The various syphilitic skin-eruptions are often well-marked over the breast. Tertiary syphilis of the breast is rare; it most commonly takes the form of a circumscribed gummatous deposit, which if untreated pursues a course similar to that of the disease elsewhere (2220). More diffuse syphilitic indurations of the gland-tissue have also been described.

2220. A section of a small piece of a breast, together with the skin covering it. In the breast-tissue is a gumma, which has extended into the subcutaneous tissue and is involving the skin. The deeper part of the gumma is of a uniform yellow colour and readily defined from the surrounding mammary and adipose tissue; the superficial part which involves the subcutaneous tissue has softened. 7678

Microscopic Structure.—A section through the gumma shows a completely degenerated central area, surrounded by a fibro-cellular overgrowth extending into the fat.

From a woman, aged 54, who was admitted into U. C. H., under the care of Mr. Godlee, October 15, 1896. She had had eight children, all of whom had died under the age of 14 months. For 3 years she had noticed a small lump in the right breast which increased slightly in size without pain: for two months the skin over the lump had been discoloured. On admission there was a small lump above the right nipple, the centre of which was soft and the overlying skin was purplish red in colour. The axillary glands were slightly larger than on the opposite side. The tumour was thought to be a gumma, but on account of some uncertainty it was excised with the skin covering it. (Mr. Godlee's *Case-Books*, 1896, vol. ii, p. 81.)

ACTINOMYCOSIS OF THE BREAST.

2221. A small piece of the breast including half the nipple, from a case of actinomycosis in which the disease extended from the lung through the chest-wall into the gland. A section through the specimen shows a small abscess-cavity, 1 cm. in diameter, lying in the superficial part of the breast-tissue; the cavity is lined with a soft layer of granulation-tissue. 7930

Microscopic Structure.—The inflammatory mass in the lung and liver was found to be extensively necrotic, but scattered through it were areas in which the ray-fungus was readily demonstrated, but the fungus was best seen in the small nodules in the lungs.

From a woman, aged 30, who was admitted into the Cancer Hospital, Brompton, under the care of Dr. Herbert Snow, June 17, 1890. In November, 1889, a lump formed in the right breast and subsequently softened and discharged. For a month before admission there had been cough with profuse night-sweats. On admission the right breast was hard and fixed to the chest-wall, and on the inner side of the nipple the skin was reddened and fluctuation was felt; there was a diffuse tender swelling below the right scapula and in this region the percussion-note, vocal fremitus and breath-sounds were much impaired; moist rales were present at the upper part of the right lung. Abundant tubercle-bacilli were present in the sputum. Several incisions were made at different times into the right breast and small quantities of curdy pus evacuated; sinuses remained and the scars became much thickened; a small quantity of curdy material was evacuated by incision into the swelling below the right scapula. The liver became gradually considerably enlarged and there was extreme tenderness over the right side of the chest. Death occurred on February 5, 1891. The right lung was firmly adherent to the parietes, and the pleura was greatly thickened; the sinuses in the right breast extended through the chest-wall into the lung. In the base of the right lung a yellowish inflammatory-looking tissue extended through the diaphragm into the right lobe of the liver, forming in the latter a rounded mass 3 inches in diameter and irregularly softened. The remainder of the right lung and the whole of the left were studded with small nodules like miliary tubercles. (Beadles, B. M. J., 1891, vol. ii, p. 124.)

Cysts of the Breast.

The various cystic affections of the breast illustrated by the following specimens include only those in which one or more cysts develop in the breast-tissue itself. Cysts developing in the substance of definite tumours of the breast belong to a different category and are illustrated by many of the specimens of tumours of the gland.

Cysts of the breast, originating in dilatation of the ducts or acini, may be single or multiple, and in either case the cysts may be simple and the contents entirely fluid, or intracystic growths may be found occupying their interior.

It is probable that the most common cause of the simple cystic affections of the breast is the obstruction of the ducts by the shrinking of a connective-tissue growth around them, but in many instances, especially when a single cyst is present, its mode of origin cannot be demonstrated. In those instances in which intracystic growths are present the mode of origin of the cysts is still more obscure, although it is probable that the formation of the cysts is determined by the obstruction resulting from the formation of a growth in one of the ducts. The intracystic growth is in most cases papillomatous in structure (2236), but it may form a more solid tumour having an adenomatous structure (2239).

The following are the more important varieties of glandular or retention-cysts of the breast:—

1. *Galactocele.*—This is rare; it is a cyst resulting from the distension of an obstructed duct with milk during lactation.

2. *Involution Cysts.*—These are small cysts very commonly met with in the atrophied breasts of old women.

3. *Cysts in Chronic Interstitial Mastitis.*—These have already been described (2214).

4. *Single Simple Cyst.*—This derives its chief practical importance from the close resemblance it may bear to a solid tumour, especially the hard form of carcinoma (2222–2224). The cyst usually contains a clear, yellowish fluid and has a smooth inner surface. Not uncommonly minute cysts, similar to those found in chronic mastitis, are present in the surrounding breast-tissue. The resemblance to a solid tumour is most close when the cyst is small, deeply seated, tensely distended and surrounded by indurated breast-tissue. Occasionally the nipple is retracted (2224).

Simple cysts, especially when situated at the periphery of the breast or on one of its surfaces, have by some pathologists been called serous cysts and are supposed to be formed by dilatation of the lymphatic spaces of the connective-tissue. Such a mode of origin is, however, doubtful and it is more probable that all such cysts originate in the glandular tissue. A cyst of this kind is preserved in No. 2226.

5. *Multiple Simple Cysts.*—Several cysts of considerable size may be met with in one or both breasts, each cyst having the characters of the single cyst above described. They probably differ in size only from the minute cysts ordinarily met with in chronic mastitis (2229, 2230).

6. *Single Duct-cyst with Intracystic Growth.*—This form of cyst is usually situated in the neighbourhood of the nipple. The intracystic growth is most commonly composed of delicate, branching, vascular papillæ covered by a layer of columnar

epithelium (Duct-papilloma, 2237, 2238). Should the duct between the cyst and the surface of the nipple be patent, a discharge of fluid from the nipple, often blood-stained, may be a prominent symptom. The simple duct-papilloma may closely resemble in its naked-eye characters the villous form of columnar-cell carcinoma of the breast. In the simple papilloma the new growth is entirely confined to the lumen of the cyst; in the malignant tumour the growth involves the surrounding breast-tissue.

7. *Multiple Cystic Disease with Intracystic Growths.*—In this affection a part or the whole of one or both breasts is converted into a number of cysts, many or all of which may contain intracystic papillary growths (2234–2236). The cysts may be uniformly small or some may reach a considerable size. If one of the superficially placed cysts becomes adherent to the skin, an opening may form into it and the intracystic growth protrude (2235). Cystic disease of this nature affecting a single lobe of the breast must be carefully distinguished from an encapsuled cystic adenoma (2235, 2236).

Hydatid cysts are occasionally found in the breast.

2222. A breast with the nipple, removed by operation. In the breast, near the nipple, is a simple cyst, the superficial part of the wall of which has been removed; it measures 3 cm. in diameter, and extends to the deepest part of the gland; the inner surface is smooth. The breast is small, but in other respects is normal. 6266

There is no history to the specimen, but it is probable that the cyst was mistaken for a solid tumour.

2223. A section of a breast, together with an elliptical piece of skin including the nipple, removed by operation. A cyst occupies the central part of the gland, and has a diameter of about 3 cm.; it projects from the deep aspect of the gland, so that in a considerable part of its extent it is in contact with the surrounding fat; the inner surface of the cyst is smooth. In other respects the breast is normal. 6153

The cyst was very tensely distended with clear serous fluid, and the breast was removed in the belief that the tumour was a carcinoma. The difficulty of diagnosis was greatly increased by the deep position of the cyst and the abundant fat surrounding the gland.

2224. Half a breast removed by operation. In the substance of the gland is a spherical cyst, 3·5 cm. in diameter. The deep surface of the cyst bulges slightly on the pectoral aspect of the breast; the wall is formed by a layer of indurated breast-tissue, which in the superficial part forms a layer, 4 mm. in thickness, in contact with the subcutaneous fat. The inner surface of the cyst is perfectly smooth. The central part of the nipple is retracted towards the cyst, and is separated from it by a distance of 7 mm. In the rest of its extent the breast-tissue is largely mixed with fat. 9107

Microscopic Structure.—The breast-tissue around the cyst showed slight dilatation of the acini, with some proliferation of the epithelium.

From a single woman, aged 48, who came under the care of Mr. Raymond Johnson in December 1902. About a month previously she had noticed a lump in the middle of the left breast. There was no pain in the part, although the breasts were always tender during menstruation, which was still regular. The central part of the left breast was rendered prominent by a rounded tumour, which, although not very hard, was thought to be solid; the overlying skin was normal, but the nipple, which was slightly retracted transversely, was held down to the surface of the tumour. The latter moved freely with the breast on the parts beneath; no enlarged glands could be felt in the axilla. The tumour was thought to be a carcinoma or sarcoma, and the whole breast, together with the axillary fat and glands, was removed.

2225. A section of a lobe of the breast, removed by operation. The section passes through a simple cyst, 2·5 cm. in diameter. The adjacent breast-tissue presents a large excess of dense fibrous tissue, and is the seat of other minute cysts. 8951

From a married woman, aged 34, who had noticed a swelling in the left breast for two years.

2226. A large cyst of the breast, removed by operation. It measures 8 cm. in its longest diameter. The wall is thin; on its inner surface numerous crescentic ridges project and doubtless indicate that the single cyst has arisen from the fusion of several smaller ones. 9534

From a woman, aged 70, who was also the subject of paralysis agitans and had several fibroid tumours of the uterus. The cyst preserved in the specimen formed a lax fluctuating tumour at the upper and outer border of the right breast; it was easily dissected out and was only loosely connected with the breast-tissue. (Mr. Godlee's *Case-books*, 1904, Catlair.)

2227. Half a cystic breast removed by operation. The section passes through three separate cysts, the largest of which measures 5·5 cm. in diameter; the latter occupies the inner part of the breast and reaches to immediately beneath the nipple, which is flattened; the inner surface of the cyst is smooth, but is marked by numerous folds, indicating that the cyst has been formed by the coalescence of numerous smaller ones. The two smaller cysts are similar in appearance. The remains of the breast-tissue which is seen on the surface of the section is fibroid and presents numerous minute cysts. 9652

From a married woman, aged 43, who was admitted into U. C. H. under the care of Mr. Raymond Johnson, September 23, 1904. A cyst of the left breast had been tapped four months previously. On admission there was a hard nodular tumour in the lower and outer quadrant of the left breast, which was thought to be solid. The breast, together with the axillary fat and glands and part of the pectoral muscle, was removed. (Mr. Godlee's *Case-books*, 1904, Maggs.)

2228. A breast with the nipple and a small piece of skin attached to it. On the deep surface of the specimen are three simple cysts, the largest measuring 1·5 cm. in diameter. They are nearly globular in form, and are lined by a smooth membrane. The breast-tissue is indurated.

These cysts were probably tensely distended with a clear serous fluid, and, being deeply seated beneath the mamma, must have closely resembled solid tumours before removal. It is not improbable that the breast was removed in mistake for cancer.

2229. The upper specimen is the left breast, together with the nipple, removed by operation and divided. The section passes through two large cysts, one measuring 3 cm., the other 2·5 cm. in diameter. The cysts are flattened where they lie in contact, and the deep part of the larger cyst, which corresponds with the pectoral surface of the breast, is very thin and translucent; on the inner surface they are smooth, but on one aspect a crescentic fold projects into the cavity of the larger one. The breast-tissue is indurated and fibroid throughout, and contains, in addition to the two large cysts above described, numerous much smaller ones. The nipple is flattened.

The lower specimen is a section of the right breast from the same case, hardened in Müller's fluid. The breast-tissue shows in a marked degree the changes resulting from chronic interstitial mastitis. The glandular lobules, easily recognised as dark areas, are widely separated by paler bands of fibrous tissue. In the deepest part of the breast are numerous small cysts, the largest of which is 5 mm. in diameter; in many of the cysts the contents have coagulated. The nipple is not retracted. 9231

From a woman under the care of Sir Victor Horsley. The right breast was removed for chronic mastitis, of which it presented the usual characters. Subsequently the left breast developed similar changes, but was the seat of definite tumours, which were thought to be possibly carcinomatous. The whole breast was therefore removed, together with the axillary glands, which were, however, healthy.

2230. Parts of the two breasts, removed by operation for chronic mastitis associated with the formation of cysts. The breast-tissue is indurated. The largest cyst, which has collapsed, is 2·5 cm. in diameter; all the cysts are lined with a smooth membrane, and some are loculated, having evidently arisen by the coalescence of smaller spaces. There are no intracystic growths. 9228

The breasts were removed by Mr. Douglas Drew from a single woman, aged 44, who had noticed enlargement of the right breast for a few months, but was unaware that the left breast was affected. Some of the cysts contained clear fluid, others thick fluid with cholesterin crystals.

2231. Half a breast removed for cystic disease. The incision has been carried through the nipple and has passed through a number of cysts. Two of these, each about 12 mm. in diameter, are situated immediately beneath the nipple. A third, about the same size, is more deeply seated in the substance of the gland. A much larger cyst is situated at the deep surface of the gland; it measures 3·5 cm. in diameter. Parts of the walls of other cysts are also seen in the section. The cysts are thick-walled and free from intracystic growths. The mammary tissue between the cysts is, for the most part, denser than natural; but between the skin and the third cyst mentioned above is an area which is spongy from the presence of many minute cysts in its substance. 3548

The breast was removed by Mr. Liston from an elderly woman, and the operation was successful. In the recent state some of the cysts contained a caseous-looking substance. The integument was natural in appearance, excepting at the nipple, where it had a livid colour and was connected with the tumour.

✓2232. A section of a breast showing commencing cystic changes in the gland-tissue. The cystic change is most marked in the superficial part of the gland between the nipple and the axillary border. In this situation is a collection of small cysts, the largest measuring 3 mm. in diameter, which give to the part a spongy structure. Beneath the nipple some of the ducts are dilated. 9020

Microscopic Structure.—The acini show irregular dilatation with ingrowths of the wall and considerable proliferation of the epithelium, which in some acini fills the lumen. There is no evidence of any extension of the epithelium into the dense fibrous tissue in which the dilated acini lie. A lymphatic gland, which was examined, is normal.

From a single woman, aged 42, who first experienced slight shooting pain in the upper and outer part of the right breast on June 30, 1902; the pain attracted the patient's attention to a lump in the breast. There was a small hard nodule in the substance of the upper and outer quadrant of the right breast; it moved freely with the breast on the pectoral muscle; the skin over it was normal and the nipple not retracted. It was thought that an enlarged gland could be felt in the axilla. The diagnosis of carcinoma was made, and, on July 9, the breast, together with part of the pectoral muscle and the axillary fat and glands, was removed by Mr. Raymond Johnson. The patient was in good health two years later.

2233. A cystic breast in coronal section. The section passes through a large number of cysts, the smallest of which are only just visible to the naked eye, whilst the largest cyst has a maximum diameter of nearly 4 cm. The largest cysts present a smooth inner surface, from which crescentic folds project, indicating the formation of the cysts by the coalescence of smaller ones. The contents of some of the smaller cysts are gelatinous. The breast-tissue is largely mixed with fat. 8991

Microscopic Structure.—The ducts and acini show all degrees of dilatation. Between the lobules, and extending into them between the acini, is an abundant dense fibrous stroma containing very few cell-elements.

From a single woman, aged 35, in whom enlargement of both breasts had been noticed for only about six weeks. She was in good health and there was no evidence of pelvic disease. Operation was performed by Mr. Mower White at the St. Pancras Infirmary. The left breast (preserved in the specimen) was completely removed; the outer part only of the right breast was removed.

2234. A cystic breast; the skin covering the gland has been removed, and the situation of the nipple cannot be recognised. An incision has been carried through the middle of the specimen. Although extensively diseased, the gland is not enlarged; it measures 10 cm. in diameter and 3 cm. in thickness. The whole gland is converted into a multitude of small cysts, the largest not being more than

8 mm. in diameter. The walls of the cysts are thin. Some of the smaller cysts communicate one with another, forming a single irregular cavity. Some of the cysts are empty and lined by a smooth membrane; others are partly or completely filled with intracystic growths. A small round solid growth, measuring 13 mm. in diameter, white in colour and firm in structure, is cut through in the upper part of the section; several similar tumours are seen projecting on the surface; they are encapsuled and very loosely connected with the surrounding tissues, but do not appear to have originated as intracystic growths. The tissue between the cysts is not very abundant, and is chiefly fat with a very small amount of fibrous tissue. The opposite gland was similarly diseased. 5758

Microscopic Structure.—The process of development of the cysts and intracystic growths can be clearly seen in the section. The first change seems to be an overgrowth of the epithelium of the acini; they are somewhat larger than natural, and filled with epithelium-cells, which stain readily with logwood. There seems also to be a slight overgrowth of the fibrous tissue forming the walls of the acini and lying between them. The fibrous tissue is in wavy bundles and fully developed. In the next stage the acini seem to increase in size and the central cells degenerate, no longer staining. In the next stage a clear space, often loculated, is formed by the dilatation of a group of acini. These spaces are lined by a single layer of cubical epithelium. In these large spaces microscopic intracystic growths can be seen; they are composed of young connective tissue surrounding a large looping vessel, and are covered by a layer of epithelium. In fact the microscopic examination explains exactly the naked-eye appearances. When the processes above described reach a certain degree the cysts and intracystic growths become visible to the naked eye.

From a single woman, aged 30, who died of acute peritonitis after the removal of a cyst of the right ovary and a subperitoneal uterine fibroid. There were numerous calcified cysts in the thyroid gland and multiple papillary growths in the pharynx (No. 1502). (Dr. Graily Hewitt's *Case-books*, 1882, p. 200.)

2235. A breast with the nipple and some of the neighbouring skin. Situated on one side of the nipple is a group of cysts, the largest of which measures about 7 cm. in diameter and the smallest about 2 cm. The cysts have very distinct walls, from which the surrounding tissues have been readily separated by dissection; they lie closely in contact one with another, forming altogether a mass more than 10 cm. across. Those lying immediately beneath the skin are adherent to it, and in one is a circular opening about 1 cm. in diameter, with ulcerating edges. All the cysts that have been opened contain intracystic growths, which only fill a small part of the cavity. Many of these growths are composed of extremely finely divided branching papillæ, and are attached to the cyst-wall by a narrow pedicle. The part of the breast which is not involved in the cystic change appears to be normal; several bristles have been passed from the nipple into the ducts, but they do not enter the cysts. 5585 A

It is important to distinguish cystic disease of a limited portion of the breast, such as is illustrated by this specimen, from a cystic adenoma. It will be noticed that the cysts are intimately connected with the gland-tissue, whereas in a cystic adenoma the cysts form part of an encapsuled tumour and are associated with a varying amount of solid growth.

The patient was a widow, aged 50, very stout. For three months before admission she had suffered from considerable pain in the breast. On admission the breast seemed to be a mass of cysts from the size of an orange downwards. The skin covering them was, in some parts, very thin and tense. The breast was freely movable on the parts beneath, and there was no enlargement of the axillary glands. The largest cyst burst, and discharged a brown turbid fluid. After this somewhat profuse hæmorrhage occurred. The breast was removed by Mr. Marshall, and the patient made a rapid recovery. (Mr. Marshall's *Case-books*, 1881, vol. i., p. 321.)

2236. A breast, together with the nipple and a small part of the surrounding skin, part of the gland being enlarged by cystic disease. The affected lobe, which projects prominently from the surface of the gland, is situated immediately beneath the nipple and to one side of it. In its upper part the diseased lobe is the seat of a number of small smooth-walled cysts, many of which have been laid open on both aspects of the specimen; they intercommunicate so as to produce a coarse meshwork. In the rest of its extent the lobe, in section, presents a more solid structure, resulting from the presence in the cysts of closely-packed, delicate papillary growths which completely fill the lumen. The remainder of the breast-tissue is apparently free from disease, but is inseparably connected with the part in which the cystic change has occurred.

This specimen illustrates a form of cystic disease similar to that in the preceding specimen. A number of glandular or duct-cysts, containing intracystic growths, have originated from the gland-tissue of one of the lobes.

2237. A slice of a breast, in which is situated a duct-cyst with an intracystic growth. The breast-tissue only remains in the form of narrow bands of fibrous tissue passing through the fat. On one surface of the specimen the cyst has been opened; it measures nearly 3 cm. in its greatest diameter, and in its most superficial part lies immediately beneath the skin. Attached to the inner surface of the cyst is a small papillary growth composed of small, closely-packed, rounded processes. On the other surface of the specimen the section passes through the nipple, which is retracted. One of the excretory ducts, which has been opened, is filled by an elongated papillary growth, attached to the wall of the duct by a short narrow pedicle. 7337

Although it is impossible to demonstrate a communication between the dilated duct which is seen in the nipple on one surface of the specimen with the cyst which has been opened on the other surface, it is probable that the cyst has arisen from dilatation of part of the same duct.

From a woman, aged 63, who was under the care of Mr. Barker in December 1894. There had been a lump in the breast for fifteen years, which had recently increased rapidly. The nipple was retracted and the skin puckered.

2238. A slice of a breast in which a duct-cyst filled by a papillomatous growth is situated in the base of the nipple. The nipple is large and prominent. The cyst, which is irregularly rounded, measures 1 cm. in diameter; it is completely filled by a dark blood-stained mass. On the deep aspect of the cyst is a group of much smaller ones, in which no intracystic growth can be seen. The breast-tissue, displayed in the section, is normal in appearance. 9241

Microscopic Structure.—The intracystic tumour is attached to the wall of the cyst by a slender pedicle, and consists of a papillomatous growth, the structure of which is almost obscured by the presence of extensive hæmorrhage into its substance. There is no evidence of new growth outside the wall of the cyst.

From a married woman, aged 49, who was under the care of Mr. Douglas Drew in the Hospital for Women, Soho Square, in March 1903. For seven years there had been discharge from the nipple, which occurred regularly about one week before each menstrual period, and was at first clear and then blood-stained. Menstruation ceased eighteen months before the patient came under treatment. In September 1902 a lump was first noticed in the right breast, but disappeared after being poulticed; in December 1902 the lump reappeared, increased in size, and became painful. In March 1903 there was a fairly hard lump beneath the right nipple and a hæmorrhagic discharge from the nipple; no glandular enlargement could be detected; the left breast felt normal. The right breast was removed on March 27, 1903.

✓ 2239. A left breast removed by operation, together with a broad elliptical strip of the overlying integument. The central part of the skin, including the nipple, has been removed in order to display a large cyst, which occupies the centre of the breast. The cyst measures nearly 5 cm. in diameter, and is bounded by a distinct wall intimately adherent to the surrounding breast-tissue and fat. The inner surface has become wrinkled and has a pale brownish colour. Projecting into the cyst in its deepest part is a solid slightly lobulated growth as large as a walnut and attached to the wall of the cyst by a slightly constricted base; the cut surface of the tumour is almost homogeneous in structure. 6778

Microscopic Structure.—The intracystic growth contains a large number of circular or cylindrical spaces lined with a single layer of columnar or cubical cells and other larger irregular spaces lined by several layers of spheroidal cells. The stroma consists of well-developed fibrous tissue containing many spindle-cells and, in some parts, fusiform collections of spheroidal cells. The fibrous capsule of the tumour is, in part, covered with a layer of columnar cells.

The specimen is a large duct-cyst with an adenomatous intracystic growth.

From a woman, aged 60, who was admitted into U. C. H. under the care of Mr. Beck, Oct. 30, 1891. Five years before, the left breast had been bruised, and twelve months before admission a small lump was noticed in the breast, which gradually increased in size and became painful. On admission the left breast was rendered prominent by a large lobulated swelling occupying its centre; the peripheral parts of the tumour fluctuated distinctly, but the central part felt more solid; the nipple was slightly retracted, and by moving the tumour it was drawn upon; the tumour was unconnected with the pectoral muscle, and no enlarged glands could be felt in the axilla. After making an exploratory incision the whole breast was removed on account of the large size of the cyst and the presence of the solid growth in its interior. The cyst contained a brownish fluid. The operation was followed by a slight attack of pleurisy on the right side. The patient left the hospital on Dec. 1. (Mr. Beck and Mr. Godlee's *Case-books*, 1892, vol. i, p. 4.)

2240. A breast with an elliptical piece of skin including the nipple, removed by operation. In the breast is a single large cyst, 11 cm. in diameter, which has been freely opened by the removal of the deep part of its wall. Occupying the interior of the cyst is a large intracystic growth, which is attached to the inner surface of the cyst-wall by a short stout pedicle. The intracystic growth measures 8 cm. in its longest diameter, and is composed of a mass of irregular foliated processes giving to the whole an appearance similar to that met with in many of the cystic adenomata. The inner surface of the cyst-wall presents throughout a warty appearance, and around the pedicle of the large intracystic tumour, as well as at the upper part of the cyst, several small papillary outgrowths are present. 7410

From a woman, aged 62, who was under the care of Mr. Barker in U. C. H. in 1895. The tumour of the breast had been noticed for two years and a half, and for six months had been growing rapidly. Before removal the cyst was aspirated and 28 ounces of brown fluid withdrawn. (Surg. Reg. Rep. 1895, p. 86, No. 1704.)

2241. Part of a breast, together with a narrow elliptical piece of skin including the nipple. The breast-tissue, as displayed by the section, is fibroid and largely mixed with fat. Projecting from the surface of the gland, near the nipple, is a cyst, through which a section has been made; it measures 4 cm. in diameter. The inner surface of the cyst presents in parts a coarsely warty appearance, and its interior is partly occupied by a number of finely subdivided papillary growths. In contact with one extremity of the main cyst is a smaller one, the interior of which is occupied by similar intracystic growths. 3364

The specimen was originally regarded as one of cystic adenoma, but the solid part of the specimen appears to be indurated breast-tissue, and with this the cysts are intimately connected. There is no evidence of the presence of any encapsuled tumour.

From a single woman, aged 50. She attributed the growth to the pressure of a crutch, which she had used for twenty years. The growth was first noticed five years before, when it was the size of a marble. It was painless and lay under the right nipple. It remained nearly stationary for a year till menstruation ceased. For the next three years it increased slowly, and for one year more rapidly. The tumour caused inconvenience by its size and weight. It was quite movable, the skin healthy and loose over it, and the nipple slightly retracted. Mr. Liston removed the breast in 1844, and the woman recovered. "The larger cyst containing the cauliflower excrescence was filled with opaque serous fluid mixed with dirty-coloured matter." The smaller cysts contained a clear albuminous fluid.

2242. A cyst of the breast, opened in order to display a number of intra-cystic growths, by which it was almost completely filled. The outer surface of the cyst has a thin layer of breast-tissue and some fat adherent to it; the inner surface is smooth, but has become wrinkled in the process of hardening. The intracystic growths form deeply-cleft masses attached at numerous points by slender pedicles to the inner surface of the cyst. The character of these growths is best seen in one which hangs from the lowest part of the specimen; its pedicle is short and extremely slender. The growth is composed of a number of lobes, each of which is subdivided by deep clefts into a number of mutually-adapted lobules; the growth is nearly white in colour and the surface of each lobule is smooth. 6927

Microscopic Structure.—The surface of the intracystic growths is covered in parts by several layers of epithelial cells, the deepest of which are cubical, and the most superficial spheroidal. The substance of the growth is composed peripherally of irregular fibrous tissue, rich in oval and spindle cells, whilst the central part of the lobules is granular and structureless.

The specimen is a large duct-cyst filled with lobulated intra-cystic fibromata.

From a woman, aged 24, who was admitted into U. C. H., under the care of Mr. Beck, Oct. 6, 1892. There was no history of injury, and the patient's general condition was in every way good. A small hard lump had been known to exist in the left breast for several years. Two months before admission the tumour began to increase rapidly in size but remained painless, and there was no discharge from the nipple. On admission there was a tumour as large as a goose's egg in the left breast; the larger end of the tumour occupied the middle of the breast, whilst the smaller end extended into the upper and inner quadrant; the tumour had a lobulated surface, but was elastic and fluctuated distinctly; the nipple and skin were normal, except that the latter, at a point above the areola, was thinned and of a bluish tint; the tumour moved freely with the breast on the surface of the pectoral muscle; a small soft gland could be felt in the axilla. On Oct. 13 the tumour was removed through an incision, 3 inches long, made over the long axis of the tumour; in some parts the cyst was readily separated from the surrounding tissues, but in other parts adherent portions of the breast-tissue required division. The patient left the hospital on Oct. 27. (Mr. Beck & Mr. Godlee's *Case-books*, 1892, vol. i, p. 1.)

2243. A piece of the fat of the mammary region, in connection with which is a cyst the size of a hazel-nut, the lumen of which is partly occupied by a soft papillomatous growth. Outside this cyst is another the size of a small pea, completely filled by a similar papillomatous growth. 6665

From a woman, aged 44, who was under the care of Mr. Beck in U. C. H., in 1889. Nearly twelve years previously the left breast had been excised for "cystic adenoma"; four years and a half later the right breast was removed for a similar condition. On admission both scars were healthy; beneath the skin, above the middle of the left scar, was an elastic tumour about an inch in diameter, which had been slowly forming for two years. The cyst, with the surrounding fat, was removed by operation. (Surg. Reg. Rep. 1889, p. 99, No. 2396.)

It is probable that the disease for which both breasts were removed, and which was described as "cystic adenoma," was in reality cystic disease of the glands, and that the cysts, which subsequently formed in the left mammary region and are preserved in the specimen, originated in a fragment of breast-tissue which escaped removal when the cystic gland was excised.

SIMPLE TUMOURS OF THE BREAST.

The only simple tumours which are common in the breast are those represented by the different varieties of adenoma. Fatty tumours occur close to the breast, but not in it. Pure fibroma, pure myxoma, and tumours containing bone and cartilage have been met with, but are pathological curiosities.

Adenoma of the Breast.

An adenoma of the breast consists of glandular elements in the form of spaces lined by epithelium, lying in a connective-tissue stroma. The many modifications which the tumour presents depend upon alterations in one or both of these two constituent parts.

Certain features are common to all varieties of adenoma:—They are always surrounded by a distinct fibrous capsule, separating them from the mammary gland-tissue, which is merely displaced by the growth of the tumour; they can be removed by enucleation, leaving the gland-tissue intact; although they may grow rapidly and attain a large size they show no tendency to local or general malignancy. Adenomata of the breast are most commonly situated at the periphery or on the surface of the gland; but tumours of similar structure are sometimes met with in the substance of the breast, and probably originate as outgrowths into the interior of a cyst, the wall of the latter forming the capsule of the tumour.

Although no sharp line of distinction can be drawn between them, the following varieties of adenoma are recognised :—

1. *Pure Adenoma.*—This is very rare. In structure it closely resembles the normal mammary gland-tissue, differing chiefly in the absence of any large collecting-ducts (2244).
2. *Hard Fibro-Adenoma.*—This is the most common simple tumour of the female breast. It is firm and of slow growth, and only in exceptional cases reaches a large size (2263). In the fresh state the tumour is of an opaque white colour, but after a few minutes' exposure to the air becomes a delicate pink. The stroma of the tumour is abundant and composed of fibrous tissue, which is often extremely dense and usually contains few vessels. The glandular spaces may resemble scattered acini, but they often take the form of irregular branching cleft-like ducts lined with cubical or very short columnar epithelium, or with several layers of more spheroidal cells. In many of these tumours the divided surface presents merely a dense fibrous structure and more or less distinct division into lobules. In other specimens the cleft-like arrangement of the glandular spaces is visible to the naked eye and produces a characteristic foliated appearance, which has been compared to the section of the heart of a cabbage (2245, 2246).
3. *Soft Fibro-Adenoma.*—This variety differs from the last only in the fact that the stroma, instead of being composed of fibrous tissue, is more or less richly cellular, being sometimes composed chiefly of spindle-cells, sometimes of fibrous tissue infiltrated with small round cells, and sometimes of a myxomatous tissue with stellate cells. These modifications in the character of the stroma explain the relative softness of the tumour and its greater rapidity of growth (2247, 2248, 2252). The name "adeno-sarcoma," which is often applied to this variety of adenoma, is incorrect on account of the simple course pursued by the growth.
4. *Cystic Adenoma.*—In this variety a striking modification occurs in the glandular elements of the tumour ; the spaces become converted into cysts, often of large size, and occupied by closely-packed, often cauliflower-like, intracystic growths. Such a tumour is usually very lobulated and may attain a large size (2261–2263). This change in the glandular spaces appears to be an exaggerated development of the foliated structure seen in many examples of fibro-adenoma. Further, the solid tissue which lies between the cysts of a cystic adenoma and also that composing the intracystic growths, presents the typical structure of the fibro-adenoma. It will also be found not uncommonly that, whilst one lobule of an adenomatous tumour presents a cystic structure, other lobules are solid and agree in structure with that of a hard or soft fibro-adenoma (2265). The skin covering a cystic adenoma is occasionally in part destroyed by ulceration, and after rupture of an underlying cyst an intracystic growth may rapidly protrude through the opening (2267).

The cystic adenoma is sometimes incorrectly called a "cysto-sarcoma."

Adenomata of the breast are not uncommonly multiple (2256, 2260), and an adenoma has been found in a breast also the seat of a carcinoma (2309, 2310), but there is no clear evidence that an adenoma is liable to be the starting-point of the growth of a carcinoma.

2244. A large adenoma of the left breast, in section. It is rounded in form, and measures about 12 cm. in diameter. Its surface is slightly lobulated, and it is enclosed in a loose capsule of areolar tissue. A piece of skin is attached to the specimen, but it is not adherent to the tumour. The section shows the tumour to be composed of small closely-packed lobules, bound together by a moderately abundant stroma of fibrous tissue. The resemblance to a section of the pancreas is almost perfect. There is one cyst about 1 cm. in diameter, seen in the section ; it has some fine papillary intracystic growths projecting into it.

Microscopic Structure.—The tumour is composed of a structure closely resembling that of the normal mamma. The groups of acini are lined with an abundant epithelium, in some places almost filling the acini. Small ducts are seen here and there communicating with the acini, but no large ducts are to be found receiving the smaller ducts. The interacinous tissue is very abundant, and composed of fully developed fibrous tissue. There is no fat mixed with the fibrous tissue anywhere.

The tumour was successfully removed by Mr. Quain in January 1857, from a woman aged 26. She had had several children and one or two miscarriages, which had always been accompanied by considerable hæmorrhage. The tumour was first noticed 18 months before the operation, and during the last six months it had increased from the size of the fist to its present dimensions. At the time of the operation the patient was in the sixth month of pregnancy. The tumour was on the left side, and did not implicate the mammary gland, which was felt quite free by the side of it. After removal it weighed 4 lbs.

2245. Half a large fibro-adenoma of the breast, measuring 10 cm. in diameter, together with the overlying skin. The tumour is at all parts enclosed in a fibrous capsule, which, while it can be more or less readily separated from the surface of the tumour, is intimately connected with the surrounding tissues. Part of the surface of the tumour which has been exposed by dissection is very lobulated. The skin, although unconnected with the growth, is stretched and somewhat thinned over its most prominent part. The cut surface of the tumour, which presents a firm fibrous structure, is intersected by fine branching clefts, giving it the characteristic appearance which has been compared to the section through the heart of a cabbage. A few small cysts are present on the surface of the section, some of which are filled by intracystic growths. 4914

Microscopic Structure.—The tumour is composed of imperfectly-developed fibrous tissue containing many small fusiform cells. Scattered throughout this are innumerable spaces, varying in size from about $\frac{1}{800}$ inch upwards, till they become visible to the naked eye. These are lined with a single layer of short columnar epithelium. Many of the spaces are rounded in form, and have outgrowths of the surrounding tissue springing up into their cavities, forming intracystic growths. These growths are covered by a similar layer of epithelium. Other spaces are slit-like or very irregular and branched.

The patient was 60 years of age. The tumour was successfully removed by Mr. Liston.

2246. A large fibro-adenoma of the breast, measuring about 10 cm. in diameter. It is irregularly globular in form and lobulated on the surface, and has been easily separated from the surrounding tissues. The section of the tumour shows it to be composed of fibrous tissue arranged in lobules and bands. There are numerous slit-like spaces giving the section the foliated structure characteristic of the fibro-adenoma of the breast. The foliated structure is more marked in some lobules than in others. 59

Microscopic Structure.—The tumour is composed of a stroma of imperfectly-developed fibrous tissue, in parts composed almost entirely of fusiform cells and round cells; in the stroma are numerous spaces, some rounded and some slit-like, lined with a small cubical epithelium, inclining to be columnar in some parts. The tumour is an example of the soft variety of fibro-adenoma, and was probably of somewhat rapid growth.

2247. Half a large soft fibro-adenoma of the breast. The section measures 19 cm. by 12·5 cm. A large piece of the skin covering the tumour is attached to it, but the nipple is not shown. The skin is tightly stretched, but not apparently implicated by the growth; two incisions have been made into it to show the tumour beneath. The under surface of the tumour is lobulated, but seems to have been separated readily from the surrounding parts. Some of the lobules are smooth, whilst others present a distinct papillary surface, as though they had projected into cysts which had been opened by the removal of the capsule. The greater part of the cut surface of the tumour presents no definite structure to the naked eye; it is divided into lobes by intersecting bands of fibrous tissue. There are, however, a few slit-like spaces, and some of the lobes of the tumour present the appearance of cysts filled by closely-packed, foliated, intracystic growths.

Microscopic Structure.—The tumour is composed of imperfectly-developed fibrous tissue, with a large proportion of small spindle-shaped cells amongst the somewhat scanty fibres. In this tissue are numerous spaces, at least one in every field of the microscope. These are lined with a single layer of short columnar epithelium. The spaces are mostly irregular in form, but some are circular.

2248. A slice of a large soft fibro-adenoma of the breast and the skin covering it. The tumour is composed of numerous lobes varying in size up to 6 cm. in diameter. These are held together by bands of connective tissue. The lobes themselves show no definite structure to the naked eye. A few small spaces are seen in the substance of the tumour, mostly about the size of millet-seeds. The skin covering the tumour is healthy and not adherent to the growth beneath. 4045

Microscopic Structure.—The tumour is composed of imperfectly-developed connective tissue containing large numbers of small, round, and oat-shaped cells. Scattered throughout this are numerous rounded spaces, varying in size from $\frac{1}{100}$ to $\frac{1}{50}$ inch in diameter, lined with small cubical or columnar epithelium (the condition of the specimen makes it difficult to make out its exact form). The spaces are mostly round, and in many parts are grouped, like acini of a racemose gland, but they are separated one from another by a much greater amount of tissue than in a healthy gland. No distinct ducts can be recognised.

The tumour was removed by Mr. Liston in U. C. H. in 1847.

2249. Half a fibro-adenoma of the breast, measuring 5 cm. in diameter. The surface is lobulated, and the tumour has evidently been readily enucleated. The cut surface of the tumour presents a dense fibrous structure, in which a few cleft-like spaces and many small spherical cysts are visible. The cysts vary in size from the smallest, which are just visible to the naked eye, up to the largest, which is 3 mm. in diameter. The inner surface of the cysts is smooth, and none of them contain intracystic growths. 7360

Microscopic Structure.—The stroma is abundant and composed of dense fibrous tissue. Scattered through the stroma are very numerous spaces, lined in most parts with a single layer of columnar epithelium-cells. The spaces vary in shape between the rounded form of the smallest spaces and the irregularly-branching clefts formed by the largest spaces.

From a woman, aged 23. There is no further history to the specimen.

2250. A fibro-adenoma of the breast, measuring about 9 cm. in its longest diameter. It is coarsely lobulated on the surface, and is enclosed in a distinct fibrous capsule. It has been dissected cleanly from the surrounding tissues, to which it seems to have been nowhere adherent. The section shows it to be partly solid and partly cystic. One large cyst measures nearly 4 cm. in its longest diameter; it is very irregular in form and lined by a smooth membrane; it contains no definite intracystic growths. At the opposite side of the tumour are three foliated masses, separated by layers of fibrous tissue; these are apparently cysts completely filled by intracystic growths. The remainder of the tumour is solid, and appears fibrous to the naked eye. 4916

Microscopic Structure.—The tumour is composed of very imperfectly developed fibrous tissue, in which are numerous spaces lined with epithelium. The epithelium is small and cubical, or in some parts columnar. It is arranged in several layers in the larger spaces; in the smaller it is in a single layer and distinctly columnar. The intracystic growths are covered superficially by epithelium, and are composed of the same structure as the bulk of the tumour.

The tumour was removed by Mr. Liston from the deep surface of the breast of a woman, aged 42.

2251. Half a small fibro-adenoma of the breast. It is oval in form, and measures 3·5 cm. in its longest diameter. It is lobulated on the surface, and enclosed in a loose capsule of areolar tissue. The section shows the tumour to be composed of a stroma of fibrous tissue, throughout which are numerous small cysts, the largest of which is about 4 mm. in diameter. These are all filled with very finely divided papillary growths. The general effect produced by this arrangement resembles, to the naked eye, a section of a racemose gland. 6205

Microscopic Structure.—The tumour is composed of a fibrous stroma, rich in cells and containing numerous spaces lined with small cubical epithelium. The larger cysts are formed by dilatation of these spaces. The intracystic growths have the same structure as the stroma, and are covered by a layer of epithelium continuous with that of the cyst-wall.

The patient was an unmarried woman, aged about 37. The tumour had been noticed for five years. It had grown very slowly, and was perfectly painless. The patient asserted that it varied in size from time to time, and had not perceptibly increased for many months. The patient had suffered from slight dysmenorrhœa. The tumour was lobulated, very freely movable, and lay at the inner border of the breast. It was easily enucleated.

2252. A breast, together with the nipple, a section having been carried through a soft fibro-adenoma, which occupies the central part of the gland. The section of the tumour measures 6 cm. by 3·5 cm. The tumour is surrounded by a delicate fibrous capsule, and projects slightly on both aspects of the gland. The nipple is normal, and the skin is unconnected with the tumour. The tumour is of fleshy consistence and of a pale yellowish-white colour, except where stained by blood. Narrow cleft-like spaces can be seen with the naked eye in the solid tumour-substance, and several cysts have been divided by the section; the largest of these, which occupies the centre of the tumour, is irregular, and near its upper end are two small cysts filled by intracystic growths. 8918

Microscopic Structure.—The tumour consists of an abundant fibrous stroma very rich in spindle-shaped cells. Scattered through the stroma are spaces lined with an irregular spheroidal epithelium; the spaces vary much in form and size—some have the form of a small duct terminating in several acini, others are much more irregular, and from the wall small intracystic growths project.

From a single woman, aged 47. There is no further history to the specimen.

2253. A large elliptical fibro-adenoma of the breast, measuring 14 cm. in length. The surface of the tumour is smooth, and in parts irregularly lobulated. The substance of the tumour, which has been displayed by the removal of a wedge-shaped slice, is of very firm texture and a yellowish colour, intersected by indistinct fibrous trabeculæ. With a magnifying-glass a few minute cysts and cleft-like spaces can be seen on the surface of the section; and one large cleft has been divided, which measures 6 cm. in length. 8215

Microscopic Structure.—The tumour is composed of very dense fibrous tissue. The glandular elements are very scanty; they occur in two forms, small rounded spaces, resembling acini lined with spheroidal cells, and narrow clefts resembling small ducts, lined with cubical cells.

From a woman, aged 19, who was under the care of Mr. Raymond Johnson in U. C. H. in 1899. A tumour of the left breast had been noticed for about a year. The tumour was situated in the upper and inner quadrant of the breast; it was removed by enucleation. (Surg. Reg. Rep. 1899, p. 196, No. 814.)

2254. Half a fibro-adenoma of the breast, together with part of the fibrous capsule which has been removed with it. The tumour measures 7·5 cm. by 5·5 cm. The surface is lobulated, and has been separated by enucleation from the capsule, part of which, very loosely connected with the tumour, remains at the upper part of the specimen. On the cut surface the tumour is seen to consist of lobules united by fibrous septa; in some parts small cleft-like spaces are just visible to the naked eye. 7650

Microscopic Structure.—The general structure of the tumour consists of an abundant fibrous stroma, containing irregular cleft-like spaces lined with a small irregular epithelium containing spheroidal nuclei. Minute examination shows that the duct-like spaces are surrounded by a definite condensed layer of stroma, and that by the growth of this layer at numerous spots into the space which it surrounds the space itself assumes the form of an irregular branching cleft.

From a woman, aged 34, who was admitted into U. C. H. under the care of Sir Victor Horsley, Sept. 11, 1896. The tumour, which was situated in the upper part of the left breast was first noticed as a small hard lump 9 months previously. The tumour was readily enucleated except at one spot, where a part of the capsule was removed with it. (Mr. Heath's *Case-books*, 1896, vol. ii, p. 13.)

2255. A section of a fibro-adenoma of the breast, together with part of the overlying skin and nipple and the adjacent gland-tissue. The tumour, which measures 12 cm. in its longest diameter, is made up of a large number of distinct lobes. The specimen has been dissected in order to display the relation of the tumour to the gland; the breast-tissue has been readily separated from the lobulated surface of the tumour as a distinct layer, with which the capsule of the tumour is incorporated. The skin has also been readily detached from the surface of the growth. 7424

There is no history to the specimen.

2256. A breast removed by operation and divided, in order to display several adenomata. The largest tumour at the upper part of the specimen measures 4 cm. in diameter; it is divided up by deep cleft-like spaces, which give the whole a foliated appearance. On one border of the breast another tumour, 3·5 cm. in diameter, has been divided; it is firm, solid, and lobulated, and one of its lobules is calcified. At another part of the border of the gland is a small irregularly-rounded tumour, completely calcified, and near this are two other quite small solid growths. 7517

Microscopic Structure.—One of the tumours, examined microscopically, presents the structure of a dense fibro-adenoma; the fibrous tissue is arranged in whorls around small irregularly-branching clefts lined with small spheroidal epithelium-cells.

From a woman, aged 59.

2257. An oval fibro-adenoma of the breast, measuring 10·5 cm. in its longest diameter. The surface of the tumour is smooth, slightly lobulated, and has been readily enucleated from its capsule. The substance of the tumour, as displayed by the removal of a wedge-shaped slice, is firm and fleshy, and the cut surface is at all parts intersected by branching cleft-like spaces. 8052

Microscopic Structure.—The stroma is composed of a somewhat richly cellular fibrous tissue. The glandular tissue is abundant, and, for the most part, consists of acini, closely resembling those of the normal breast.

There is no history to the specimen.

2258. A large lobulated fibro-adenoma of the breast, removed by operation; it measures 12 cm. in its longest diameter. The surface of the tumour is smooth and prominently lobulated, especially at the upper end. The divided surface of the growth is compact and intersected by septa of glistening white fibrous tissue; it presents a few cleft-like spaces. 8667

Microscopic Structure.—The tumour is composed almost entirely of fibrous tissue, rich in small round and oval cells. The glandular tissue is represented only by a few cleft-like spaces lined with epithelium.

From a woman, aged 30, who was under the care of Mr. Godlee in U. C. H. in 1901. A tumour of the left breast had been noticed for three years. It was freely movable, and was easily enucleated from its capsule. (Surg. Reg. Rep. 1901, p. 112, No. 307.)

2259. A section of part of the right breast removed by operation for chronic inflammation. In the centre of the section is a cyst, 1·5 cm. in diameter and in other parts of the section numerous minute cysts have been opened. The lower specimen consists of a small piece of the opposite breast, in which is embedded an oval fibro-adenoma, 18 mm. in diameter. 9271

Microscopic Structure.—The structure of the tumour closely resembles that of No. 2254. The formation of a dense fibrous layer around the glandular spaces is well shown, as well as the conversion of the glandular spaces into irregular branching clefts by the ingrowth of processes of the surrounding fibrous tissue into the lumen.

From a married woman, aged 52.

2260. A section of a breast, in which two fibro-adenomata are present. The larger tumour projects from the deep aspect of the breast, and its lobulated surface has been partly displayed by the removal of some of the surrounding breast-tissue. The section of the tumour shows some of the fine clefts so commonly present; the outline between the tumour and the breast-tissue is well-defined. In the superficial part of the breast the section displays another small rounded fibro-adenoma, 1·5 cm. in diameter, the superficial surface of which is in contact with the subcutaneous fat. 9508

Microscopic Structure.—The tumour consists of a dense fibrous stroma, in which are a few irregular clefts lined with epithelium.

There is no history to the specimen.

2261. A section of a large cystic adenoma of the mamma. The slice is oval in form; at one end it is solid and shows no definite structure to the naked eye, beyond being divided into lobes by bands of fibrous tissue. About the middle of the specimen are a few slit-like spaces without intracystic growths. The lower part of the specimen is composed of numerous cysts completely filled by intracystic growths; these spring from all parts of the circumference of the cyst, and meeting in the middle form a closely-packed foliated mass. A piece of the skin covering the tumour has been preserved; it is stretched and somewhat adherent to the capsule of the tumour as the result of the irritation caused by the pressure of the growth, but it is not implicated. 4984

Microscopic Structure.—The stroma consists of an almost hyaline matrix with small round cells. The glandular spaces form irregular clefts, from which the epithelial lining has almost entirely disappeared.

2262. A section of a very large cystic adenoma of the breast. The tumour is composed of imperfectly-developed fibrous tissue, appearing in some parts homogeneous, in others indistinctly fibrous; scattered throughout the fibrous basis are irregularly-spheroidal cysts, the smallest of which are only just visible to the naked eye, whilst the largest has a diameter of 7 cm. The cysts are more or less completely filled by irregularly-papillated and pedunculated growths springing from the surrounding solid tissue. The structure of these intracystic growths is similar to that of the basis of the tumour. The cysts are lined by a smooth membrane continued over the intracystic growths. In the largest cyst the intracystic growth presents an appearance resembling the head of a cauliflower. 4785

Microscopic Structure.—The condition of the specimen renders accurate microscopic examination impossible, but it can be seen that the solid parts of the growth consist of a dense fibrous stroma containing irregular epithelium-lined spaces.

From a woman, aged 59, who was under the care of Mr. Quain. She had always enjoyed good health till five years before the removal of the tumour, when she became nervous and generally unwell. One year after this the tumour appeared as a small lump on the outer side of the left breast and gradually increased in size, the development being more rapid in the last year. Before removal the tumour was lobulated and elastic at points. The skin was healthy, but greatly stretched. The tumour was pendulous and had no connections with the muscles beneath. There was no pain or enlargement of the glands. Immediately after removal the tumour weighed 7 lbs. 3 ozs. On cutting into it a large amount of fluid escaped from the cysts. Parts of the solid portion of the tumour presented a transparent yellowish gelatinous aspect, whilst other parts were distinctly fibrous. The fluid in the cysts varied from pale straw to dark reddish brown in colour, and in consistence from that of water to a thin jelly. The patient made a rapid recovery.

2263. Half a very large cystic adenoma of the breast, together with the overlying skin, the section having passed through the nipple. The tumour measures 21 cm. and 13 cm. in its two chief diameters. The integument is not implicated by the growth, and in many parts a thin layer of fat separates it from the surface of the tumour; around the nipple, however, the skin has been stretched and somewhat thinned over a prominent part of the growth. In another position the skin presents a similar appearance and has given way over the most prominent part of the tumour, producing an opening 2 cm. in diameter, in which the surface of the tumour is exposed. The deep surface of the tumour is smooth and lobulated, and the surrounding tissues have been readily separated from it. On this surface a large cyst has been opened and is seen to be partly occupied by a large number of rounded intracystic growths. In its upper part, the cut surface of the tumour is almost entirely solid and presents to the naked eye a fibrous structure. In its lower two-thirds the section displays numerous large thick-walled cysts filled with closely-packed intracystic growths springing from their walls. 8435

Microscopic Structure.—The stroma of the tumour is composed of loose connective tissue, presenting fine granular areas, probably due to degeneration. The glandular elements are scanty, and for the most part take the form of irregularly-grouped and slightly dilated acini.

From a woman, aged 40, who was under the care of Mr. Douglas Drew, in 1900. The tumour was first noticed five years previously; fourteen days before its removal one of the cysts in the tumour ruptured through the thinned overlying skin. The tumour was removed with the skin over it, the deep surface being readily enucleated. The patient made a rapid recovery.

2264. Half a large oval tumour of the breast, with the fat surrounding it and the skin covering it. The tumour measures 11 cm. by 8 cm. It is separated from the surrounding tissues by a distinct fibrous capsule, to which it is but loosely adherent. The tumour is for the most part solid, and is composed of a soft white substance, presenting no definite structure to the naked eye. In its most superficial part is a large cyst extending over the whole length of the tumour and partly filled by irregular intracystic growths. In some parts these are divided into finer processes; they are for the most part white and firm in structure, but in the recent state some were darkly blood-stained. Superficially, the cyst-wall is in close contact with the skin, but is not adherent to it. 6208

Microscopic Structure.—The tumour is composed of fibrous tissue, containing a large proportion of oat-shaped cells between the fibres. In this are scattered spaces of irregular form, lined with a small cubical epithelium.

From a woman, aged 59, who was admitted into U. C. H. under the care of Mr. Godlee, April 15, 1886. She had been married twenty-four years, but had had no children. There was no history of injury or previous disease. Eight months before admission she felt a small lump in the right breast about the size of a nutmeg: this gradually increased and then another lump appeared on the inner side of the nipple. These grew slowly for six months, and then more rapidly till admission. There had been little pain. On admission the right breast measured 17 inches in circumference. The skin covering the breast above the nipple was healthy, and moved freely over the growth; below the nipple it was much stretched, shining, and red, but not implicated by the growth. The surface of the tumour was slightly lobulated. It was very elastic, but fluctuation was not detected. Some blood-stained fluid was drawn off by aspiration. The tumour was freely movable on the deep structures and there was no glandular enlargement.

The tumour was removed with the skin covering it. (Surg. Reg. Rep. 1886, p. 128, No. 748.)

2265. Half an irregularly-oval cystic adenoma of the breast, measuring 11 cm. in its longest diameter. The surface of the tumour is slightly lobulated and in several places intracystic growths are exposed upon it. In the upper part of the divided surface the tumour presents the ordinary appearances of a soft fibro-adenoma, consisting of a solid substance intersected by fine irregular clefts. In the middle part the appearances differ only in the much greater size of the clefts which break up the solid tumour-substance. In the lowest part the tumour is distinctly cystic, the spaces, which appear to have resulted from an opening up of the clefts above described, being occupied by foliaceous intracystic growths. 6247

Microscopic Structure.—A section of the middle part of the tumour shows a loose cellular connective tissue, in which are irregular spaces lined with epithelium which in many parts is distinctly columnar. Into some of the spaces small ingrowths of the stroma project.

There is no history to the specimen.

2266. Half a breast, together with a large cystic adenoma, with the skin covering it, and half the nipple. The tumour measures about 8 cm. in diameter. It is enclosed in a fibrous capsule, in some parts of considerable thickness; at the under surface this is wanting, as the deep part of the tumour has either been cut away after removal or during the operation. The nipple, with the atrophied mammary gland, can be separated from the surface of the tumour, which has not implicated it. The cut surface shows a foliated structure. In some parts there are rounded groups of closely-packed processes, apparently intracystic growths, completely filling the cysts in which they lie. The under surface of the tumour shows three large lobules, which have been cut through, and present a similar structure. The skin covering the tumour is stretched but not implicated in the growth. (See No. 2267.) 4880

2267. Half a tumour which arose in the scar three years after the removal of the preceding specimen. It closely resembles the original tumour in structure, but is coarser in arrangement. The deep surface of the tumour has a somewhat imperfect fibrous capsule, but this is not readily separable from the surrounding parts, and a piece of the subjacent muscle has been removed with the tumour. The skin covering the growth presents a cicatrix, and is inseparably blended with the capsule; over an area of about 3 cm. in diameter it has given way, allowing a protrusion of the growth. This projects about 3 cm. and measures about the same transversely. Its surface is superficially ulcerated and shows fissures due to the foliated structure of the protruding mass. 4919

Microscopic Structure.—The recurrent tumour is composed of round and oval cells of considerable size, with scarcely a trace of fibrous stroma. The surface of the papillary masses is in some parts covered by cubical epithelium, but in many places this seems to have been lost.

The tumour was removed by Mr. Liston from a woman, 37 years of age. The primary growth was described by him as being "composed of medullary-looking matter arranged in an irregularly dendritic form." The secondary growth was probably merely a fragment of the primary tumour left behind at the first operation. It was removed three years afterwards. It was described by Mr. Liston as "a nodulated fungus of red colour," and its arrangement was compared to that of the cerebellum.

SARCOMA OF THE BREAST.

Sarcoma of the breast is rare; it is usually met with as a soft and rapidly-growing tumour occurring about middle life. In the early stages it forms a rounded tumour at one side of, or in the substance of, the breast. The outline of the tumour is well-defined, but it is intimately connected with the surrounding breast-tissue. As the growth increases it frequently becomes more lobulated and soon causes an elevation of the surface. The overlying skin is at first normal, but as the tumour increases the superficial veins become distended; later the skin is thinned over the tumour, assumes a livid or purple tint, and finally gives way, allowing the soft tumour-substance to protrude (2272). If any change occurs in the nipple it is dependent merely on the size of the tumour; thus it may be displaced and flattened, or may appear to be retracted as the result of the projection of a centrally situated tumour around it. As a rule the tumour, even in advanced stages of its growth, remains freely movable on the pectoral muscle. The lymphatic glands are usually unaffected. The malignancy of the tumour manifests itself chiefly in the tendency to recur locally after removal (2269), but dissemination by the blood-stream may occur. On section a sarcoma of the breast is usually soft and some times brain-like, and the cut surface is convex. Its outline is usually sharply defined and it is surrounded by a layer of condensed areolar tissue, but this is not readily separable either from the tumour or the surrounding tissues (2270). The colour of the tumour is usually pink at its margin, but at its central part it is often yellowish from fatty degeneration or stained by hæmorrhage (2277), and cysts from mucous softening, hæmorrhage, or degeneration are not uncommon (2268). Sarcomata of the breast vary widely in their minute structure; the most common are the large spindle-cell sarcoma and the small round-cell sarcoma. Alveolar sarcoma (2273, 2275) and myxosarcoma also occur.

From an examination of the specimens of the breast it will be readily understood that the disease has many clinical resemblances to the soft forms of fibro-adenoma on the one hand and to soft carcinoma on the other hand.

2268. Half a soft sarcoma removed from the breast. The tumour measures about 6 cm. in diameter, and is nearly globular in form. A piece of skin has been removed with the tumour; it is not implicated by the growth. The greater part of the tumour is extremely soft and much broken down, and stained by hæmorrhage into its substance. On the side nearest the skin is a large cavity formed by hæmorrhage into the substance of the tumour and degeneration of its structure. At the opposite side are some layers composed chiefly of blood-clot arranged like the laminated clot in an aneurism. At some parts of the circumference there is a layer of more solid tissue. The tumour is in part surrounded by a fibrous layer, but has no distinct capsule; it is adherent to the surrounding fat, which has been removed with it. (See No. 2269.) 3697

2269. A mass of fat from the chest-wall with some skin, in which is the scar left after removal of the preceding specimen. Some of the fibres of the pectoralis major are adherent to the under surface of the specimen. In the line of the scar are two soft sarcomatous tumours. One is pyriform and projects above the level of the skin for about 1 cm.; its long diameter is 2·5 cm. The other is more deeply seated. Both are composed of a structure resembling that of the softer parts of the preceding specimen. 3698

Microscopic Structure.—The tumour is a small round-cell sarcoma. The microscopic section is composed to a great extent of blood-clot, in which scattered fragments of the tumour are to be recognised.

The primary tumour was removed from the breast of a woman, aged 32, by Mr. Liston in 1835. At the upper part of the tumour was a cyst containing blood and brain-like matter. Recurrence took place in two places in the scar not long afterwards. The scar, with part of the pectoralis major, was removed, and the patient was in good health seven years afterwards.

2270. Half a large soft sarcoma of the breast with the surrounding fat and some of the skin covering it. The tumour is almost globular in form and measures 7 cm. in diameter; its outline is somewhat imperfectly defined by a line of condensed areolar tissue around it, but it has no distinct capsule, nor can it be clearly separated from the surrounding parts. The structure of the tumour is soft and almost spongy in parts; in the centre it is further softened by degeneration. 5880

Microscopic Structure.—The tumour is a sarcoma. The cells are small and round or irregular.

From a woman, aged 56, who was admitted into U. C. H., under the care of Mr. Marshall, Jan. 24, 1883. A tender lump had been noticed in the left breast since the previous July. On admission the left breast was greatly enlarged, especially in the upper half; the nipple was not retracted, but there was a discharge of clear straw-coloured fluid from it; the skin was reddened over the centre of the tumour and the superficial veins were dilated; the surface and borders of the tumour were lobulated and well-defined; the tumour moved freely with the breast on the surface of the pectoral muscle; fluctuation could be felt in the most prominent central part of the tumour. No enlarged glands could be felt in the axilla. The breast was removed on Jan. 27, and the patient discharged on Feb. 23. The subsequent history is not noted. (Surg. Reg. Rep. 1883, p. 96, No. 152.)

2271. A section of a sarcoma of the breast, carried through the nipple. On the divided surface of the specimen only the tumour-substance is recognisable; it is granular and friable and incompletely divided into lobes by indefinite fibrous septa; in some parts the growth is stained by hæmorrhage, and in one situation presents a considerable cavity, probably resulting from degeneration and hæmorrhage. Superficially the tumour extends up to, but does not appear to involve, the skin, the nipple also being normal; the deep surface of the tumour reaches the pectoral fascia. On the opposite surface of the specimen a few strands of breast-tissue can be seen in the fat. 7002

Microscopic Structure.—The tumour is a mixed-cell sarcoma. Some areas are almost entirely cellular and consist of spheroidal or short spindle-shaped cells; in other parts spheroidal cells lie in a delicate meshwork of branched cells.

From a woman, aged 52, who was under the care of Mr. Godlee in U. C. H. in 1893. The patient had only noticed the enlargement of the breast for two weeks. On admission the right breast was three or four times as large as the left, and the skin over it was of a deep purple colour. The tumour, which seemed to involve nearly the whole breast, was in most parts firm, but in some places was soft and fluctuating. The tumour did not move freely on the pectoral muscle. No enlarged glands could be felt in the axilla, but an indurated cord extended from the tumour into the axilla. The breast, together with the axillary glands and fat, was removed. The subsequent history of the case was not recorded. (Surg. Reg. Rep. 1893, p. 84, No. 1469.)

N B.
rapidit
of grow

2272. A soft sarcoma of the breast, with the skin covering it. The tumour is irregularly circular in outline and measures 10 cm. in diameter. The situation of the nipple cannot be clearly recognised. The skin covering the tumour is stretched and smooth; it is raised into numerous rounded elevations by the growth beneath. At one point the skin has given way, and a small opening exists 8 mm. in diameter. The section shows the growth to consist of a fibrous reticulum, the meshes of which are filled with a soft granular substance; it is somewhat darkly stained by hæmorrhage into its substance. The deep surface of the tumour is adherent to the pectoralis major, a piece of which has been removed with it. The limits of the tumour are clearly marked, but it has no definite capsule. 3741

Microscopic Structure.—The tumour is a small round-cell sarcoma. At its deep surface the growth extends among the fibres of the pectoral muscle.

The tumour was removed by Mr. Syme. In the old catalogue it was described as "cystic," but an incision into it shows that it is in reality a very soft solid growth.

2273. A piece of breast-tissue, containing a small sarcomatous tumour, in section. The tumour is oval and measures 2 cm. by 1·5 cm. The outline of the tumour is well-defined, but it is intimately connected with the breast-tissue. The cut surface of the tumour presents to the naked eye a compact homogeneous appearance. 8700

Microscopic Structure.—The tumour is a large round-cell sarcoma with alveolar arrangement. There were no secondary deposits in the lymphatic glands.

From a woman, aged 45, who was under the care of Mr. Pollard in U. C. H. in 1901. The tumour had been noticed at the upper margin of the left breast for three months. The tumour was somewhat flattened and measured 1 inch in diameter; it was smooth and elastic, and connected with the breast-tissue. The breast, together with the axillary contents, was removed. The axillary glands were not diseased. (Surg. Reg. Rep. 1901, p. 94, No. 679.)

2274. A slice of a breast which is the seat of a diffuse sarcoma. No normal breast-tissue is recognisable. The growth has a compact structure, and is in parts separated into lobules by fibrous septa. 7638

Microscopic Structure.—The tumour is a small round-cell sarcoma with a very delicate fibrillated stroma.

From a woman, aged 35, who was admitted into U. C. H. in 1896. Nine weeks before admission a swelling was noticed beneath the jaw on the right side and was soon followed by a similar swelling on the left side; seven weeks later both breasts became enlarged and tender. On admission the patient was four months pregnant; the temperature varied from 100° to 101°, and the pulse-rate was 120; both upper jaws were involved in a fungating growth in which all the teeth, except the central incisors, were embedded; the lower jaw, except in the central part, was similarly affected; the submaxillary lymphatic glands were much enlarged. Both breasts were enlarged and nodular, and there was enlargement of the glands in both axillæ; the uterus reached nearly to the umbilicus, and a mass could be felt behind it and in the left iliac fossa. Three days after admission the temperature rose to 106°·2 without a rigor, and the patient died. In addition to the disease of the breasts and jaws there was a soft friable tumour in each ovary; the iliac vessels on the left side were also surrounded by a mass of growth. (Surg. Reg. Rep. 1896, p. 122, No. 1362.)

2275. A section of the axillary border of a breast with the skin covering it. On the surface of the section a small tumour embedded in the breast-tissue is displayed; it is nearly circular in outline, and 8 mm. in diameter. The tumour-substance is finely granular, and it is surrounded by a delicate fibrous layer intimately adherent to the tumour-substance and to the surrounding breast-tissue.

Microscopic Structure.—The tumour is an alveolar sarcoma. Examined under a low power of the microscope the resemblance to a spheroidal-cell carcinoma is close, but under a higher power the relation of the stroma to the cells clearly shows that the cells are of connective-tissue origin and not epithelium.

The breast was removed under the impression that the nodule was "scirrhous cancer," and was subsequently described as "chronic mastitis." There was some slight enlargement with induration of the lymphatic glands.

2276. Half a large tumour of the breast with part of the skin covering the gland and the nipple. The tumour measures 14 cm. in its transverse diameter; it is very soft, and is composed of numerous lobules, in some parts ill-defined and separated by a small quantity of fibrous tissue, in others separated by slit-like intervals. The tumour is enclosed in a delicate capsule of connective tissue, best marked at its under surface. The skin is tightly stretched over it, but not implicated in the growth. On the posterior surface of the specimen it can be seen that the breast-tissue is readily separable from the surface of the tumour. 4924

Microscopic Structure.—The general structure is that of a sarcoma, the cells being irregularly rounded and having in some parts a slightly alveolar arrangement. The vascular spaces are very large and numerous, and in many places the tumour-cells are arranged in thick layers immediately outside the endothelium bounding the blood-spaces.

The tumour was removed by Mr. Liston from a woman, aged 46. It weighed nearly seven pounds. It was softened and broken down in places. There was no return of the disease after "many years."

2277. Half a breast, the seat of a sarcomatous tumour, prepared with formalin. The tumour, which is nearly circular in outline and 3 cm. in diameter, is deeply placed, extending nearly to the pectoral fascia, but being separated from the skin by a layer of fat 1 cm. in thickness. The greater part of the section of the growth is irregularly stained by hæmorrhage, but there is a peripheral zone free from hæmorrhage and indistinctly marked off from the surrounding fat. Remains of the breast-tissue can be seen in the fat beneath the nipple. The nipple is tilted, but not distinctly retracted. There was no evidence of disease of the axillary glands. 8952

Microscopic Structure.—The tumour is composed chiefly of a connective-tissue stroma, rich in round and short spindle-shaped cells and with many large thin-walled blood-spaces. Scattered through the growth are collections of rounded, much degenerated cells, which are, however, so intimately associated with the connective tissue that the growth must be regarded as a mixed-cell sarcoma.

From a married woman, aged 58, who accidentally discovered a lump in the right breast on April 4, 1902. The tumour, which was situated in the upper and outer quadrant, was as large as a small orange; it felt solid and not very hard; it moved freely with the breast, but not independently of it; the nipple was normal; the skin was very loosely held to the surface of the tumour; a gland could be felt in the axilla. On April 7, the whole breast, together with the axillary fat and glands was removed, the diagnosis of carcinoma having been made. From the appearance of the tumour in the fresh state it was considered as being probably a sarcoma. The axillary gland showed fatty changes.

CARCINOMA OF THE BREAST.

Carcinoma of the breast is very common. Spheroidal-cell carcinoma constitutes the ordinary form and originates in the epithelium of the acini. Columnar-cell carcinoma is occasionally met with and takes its origin in the epithelium of the ducts. Squamous-cell carcinoma of the nipple and areola is very rare.

Spheroidal-cell Carcinoma of the Breast.

Spheroidal-cell carcinoma is met with in the breast in three chief forms—hard, soft, and colloid. Between the hard and soft forms no sharp line of distinction can be drawn, and the difference in consistence is dependent chiefly upon the varying proportions of the fibrous stroma to the epithelial elements. The colloid form is dependent upon a special degenerative change occurring in the epithelium.

1. *Hard Spheroidal-cell Carcinoma.*—The hard nodular variety of spheroidal-cell carcinoma (nodular or circumscribed scirrhus) is the most common tumour of the female breast. The tumour in its earliest stage presents itself as a small, well-defined, very hard nodule in the breast-tissue, with which it is intimately connected. A very characteristic feature of the tumour is the traction which it exerts on the tissues around it, noticeably upon the breast-tissue, the skin, the nipple, and the fascia and muscle beneath the breast. The characters of the tumour and its effects on the tissues around it are best studied in a section of the breast carried through the nipple and the tumour. The cut surface of the tumour itself is, in the fresh state, slightly concave or cupped, and if scraped yields a thick creamy juice; the tumour-substance is greyish or sometimes bluish grey in colour, and marked by opaque yellowish-white lines and dots, giving it the appearance which has been well compared to the section of an unripe pear (2278). The margin of the tumour is often well-defined, but it is inseparably connected with the tissues around it and no capsule is present. The changes produced in the tissues around the tumour are dependent upon its contraction, which naturally varies much in different specimens. The condition of the surrounding breast-tissue is very variable, it may present a normal appearance, but often it has to a large extent atrophied.

The earliest change in the overlying skin is that by the traction of the tumour on the suspensory ligaments the skin is loosely held to the surface of the tumour later it becomes more and more adherent so as to be dimpled or puckered, and finally it is actually invaded by the growth (2288). The changes in the nipple are similar to those in the skin; in the early stages whilst the nipple is still normal in appearance it is held to the tumour by the intervening ducts; as the traction on the latter increases the nipple becomes progressively retracted (2279–2281) and may finally be deeply depressed and adherent to the surface of the tumour (2282). On the deep aspect of the tumour similar changes occur, resulting in adhesion of the tumour to the fascia covering the pectoral muscle, and later to the drawing up of the muscular tissue into the growth and to its actual invasion by the disease (2284, 2293). The extent of the above changes and the period at which they occur depend upon the degree of contraction occurring in the tumour and the part of the breast in which it is situated. Thus, a tumour at the periphery of the gland may become firmly attached to the pectoral muscle and adherent to the skin while the nipple still remains normal (2285, 2286, 2288); whilst, on the other hand, a tumour in the centre of the breast may cause extreme retraction of the nipple, while the growth is still so small as to be scarcely recognisable (2284). When a hard carcinoma of the breast invades the skin the latter becomes at first smooth and leathery or warty in appearance (2284, 2290); it may then ulcerate, a small crack or fissure forming in it covered by a scab. The floor of the ulcer may be in this stage but little raised above the level of the surrounding skin (2289). In other cases the tumour may form a considerable projection before ulceration takes place. After a time the ulceration extends deeply into the structure of the tumour. The characteristic cancerous ulcer is then formed: it has raised hard edges often everted; the edges sink abruptly to the surface of the ulcer, which is irregular and usually covered by sloughing tissue. The base of the ulcer is hard, being formed by the advancing part of the cancer (2292). When the skin is implicated the disease may spread rapidly in the cutis, extending far beyond the deeper parts of the growth.

When the shrinking of a hard nodular carcinoma occurs in an unusually marked degree, the name "atrophic" is applied to it (atrophic or withering scirrhus). The tumour is often very small and of very slow growth, and the changes produced in the tissues around it by the shrinking of the tumour are strikingly shown (2283, 2284).

In a much less common form of hard carcinoma the tumour infiltrates the breast-tissue more widely and is badly defined (diffuse scirrhus, 2296). The tumour is usually softer than the nodular variety, and the shrinking is but little marked.

2. *Soft Spheroidal-cell Carcinoma.*—No sharp line can be drawn between the hard and soft forms of carcinoma. Soft carcinoma may be circumscribed (2297), but more commonly it is diffused and infiltrates the neighbouring parts widely (2300). During its growth it shows little tendency to shrinking; occasionally its central parts may degenerate and break down into a pulpy mass mixed with blood (2299). Its cut surface is usually flat; it is milky-white in colour and yields abundant juice on scraping. If it implicates the skin a fungating mass may protrude as soon as ulceration takes place (2300). Microscopically the soft only differs from the hard form of carcinoma in containing relatively less fibrous stroma, and more cells and larger blood-vessels; the cells also may be larger.

3. *Colloid Carcinoma.*—This is merely a modification of ordinary spheroidal-cell carcinoma in which colloid degeneration of the cells has taken place. Microscopically, this process first shows itself by the appearance of a clear globule of colloid matter in the cell, usually pushing the nucleus to one side. Finally the cell becomes completely destroyed, its wall gives way and the colloid globule becomes free. Thus, in a tumour undergoing this change, the alveolar spaces at last become filled with a clear glutinous substance, sometimes colourless, sometimes pinkish in tint, in which the microscope shows a few granules representing the remains of the cells. Colloid degeneration is accompanied by increase in size. Thus the alveoli become distended by the colloid matter until they are plainly visible to the naked eye, producing the appearance of a delicate meshwork filled with jelly-like substance (2301, 2302). It is very rare to find a tumour in which this change has invaded the whole of the growth. In almost all specimens a considerable part remains unchanged, showing the ordinary appearances of a rather soft form of nodular carcinoma (2304). When colloid carcinoma invades the skin it often projects considerably above the surface (2302, 2304). The ulcerated surface is covered by a thick scab, composed of the dried colloid matter. Colloid degeneration retards the growth of the tumour and diminishes its malignancy.

In all forms of spheroidal-cell carcinoma there is an early tendency to the extension of the disease by way of the lymphatic vessels, as can often be demonstrated by microscopic examination of the breast-tissue around the tumour and of the fascia covering its deep surface. The most common clinical evidence of lymphatic invasion is the detection of enlargement of the axillary glands (2294, 2295). In the later stages the disease may extend to the lymphatic glands above the clavicle (2294) and through the lymphatics of the intercostal spaces into the mediastinum. Occasionally an extensive affection of the lymphatics of the skin of the mammary region is met with. Of the parts to which the disease may extend by way of the blood-stream the most important are the liver, the lungs, and the bones.

Carcinoma of the breast is occasionally preceded by a chronic form of dermatitis affecting the nipple and areola, commonly known as "*Paget's disease*" (2316, 2317). There is no doubt that some close relation exists between the dermatitis and the development of the tumour, but the exact nature of the relation is not known. The carcinoma met with in these cases is almost always of the spheroidal-cell variety.

2278. A superficial slice taken from a carcinoma of the breast, including the nipple and the skin surrounding it. The nipple is not retracted: the skin on one side of the nipple is implicated by the growth; it is smooth and stretched and has lost its natural wrinkles. Ulceration has taken place in an irregular area nearly 2 cm. in diameter. The edges of the ulcer are raised above the level of the surrounding parts, and the surface of the ulcer is at the same level. The skin around the ulcer was much discoloured by hæmorrhage into its substance. The section of the carcinoma on the deep surface of the specimen is smooth and evidently very hard; it is grey in colour and marked by white lines and dots, formed by collections of epithelial cells. It shows in a marked degree the appearance which has been compared to the section of an unripe pear, and which is characteristic of the hard form of carcinoma (scirrhus).

Hard Spheroidal-cell Carcinoma causing Retraction of the Nipple.

2279. A section of a breast removed by operation for carcinoma. On the surface of the section the tumour is seen as an irregularly-pyramidal mass in the centre of the gland, measuring 4 cm. across. The outline of the tumour is readily distinguishable from the surrounding fat, but is less sharply defined from the remains of the breast-tissue. The most superficial part of the tumour lies immediately beneath the nipple, which is slightly drawn towards it, so that the surface of the nipple shows a slight degree of retraction. The deep surface of the gland is separated from the pectoral muscle by a layer of fat at least 5 mm. in thickness; the part of the muscle removed is healthy. The cut surface of the tumour presents a firm consistence and an indistinct division into lobes by fibrous septa. 8928

Microscopic Structure.—The tumour is a spheroidal-cell carcinoma. The cell-masses are large and occupy alveoli surrounded by a loose cellular stroma.

From a married woman, aged 52, who had noticed a lump in the right breast for two months. She had had seven children, the youngest of whom was 13 years old; she had only suckled the first child, because of abscesses which formed in both breasts. There was a tumour situated in the central part of the right breast and there was considerable enlargement of the axillary glands. The breast, together with part of the pectoral muscle and the axillary fat and glands, was removed by Mr. Godlee on Feb. 12, 1902. In Feb. 1904 the patient was in good health and there was no evidence of recurrence.

2280. Half a breast removed for carcinoma, the section having been carried through the skin close to the nipple. The section displays a central tumour surrounded by fat, a few fibrous lines in which indicate all that remains of the breast-tissue. At its periphery the tumour is intimately connected with the surrounding fat and superficially involves the skin, which is thickened and together with the nipple is retracted by the shrinking of the growth. The cut surface of the tumour presents the characteristic appearances of a hard carcinoma; it has a very dense texture and a dull greyish colour irregularly intersected with fine yellow streaks. 8876

Microscopic Structure.—The tumour is a spheroidal-cell carcinoma.

From a married woman, aged 74, who had had several children. In June 1901 retraction of the left nipple was noticed, and a few days later a lump was accidentally found to be present in the breast; the tumour very slowly increased in size and was attended with a feeling of discomfort, but scarcely any pain. In the following December the nipple was found to be deeply retracted into a hard lump in the centre of the breast, across which there was a long pucker in the skin; the tumour moved freely on the pectoral muscle and there were no palpable glands in the axilla. On Dec. 10 the breast, together with the axillary fat and glands, was removed by Mr. Raymond Johnson. Early in 1904 the patient began to experience pain in the right forearm and left leg. Radiographic examination showed deposits of growth in the ulna and tibia (No. 747 A). There was also a small nodule of recurrent growth in the skin above the scar. The patient died a few months later.

2281. Half a breast, which is the seat of a carcinoma, together with the skin covering it and the nipple. The skin is healthy. The nipple is deeply retracted, so that it lies below the level of the surrounding skin with a deep sulcus around it; its surface is somewhat coarsely papillated, but otherwise healthy. The tumour is situated beneath the nipple and extends laterally in the fat for 3 cm. in one direction and 1 cm. in the other. The cut surface of the tumour is grey in colour and slightly depressed below the level of the surrounding fat. It is marked by small circular openings, which are the slightly dilated ducts of the gland implicated in the growth. The outline of the tumour is irregular, but definite. The mammary gland is almost completely atrophied, scarcely any glandular tissue being recognisable beyond the limits of the tumour. 4882 A

The tumour was removed from an old woman by Mr. Liston. It is a specimen of atrophic scirrhus, and shows the implication of the ducts in the shrinking tissue and the consequent retraction of the nipple.

2282. A section of a breast showing extreme retraction of the nipple resulting from the growth of a small hard carcinoma in the centre of the gland. The tumour (which is discoloured by hæmorrhage), the breast-tissue, surrounding fat, and the pectoral muscle are all easily recognised on the cut surface. The section of the axillary fat passes through two lymphatic glands, which are the seat of secondary deposits. 9118

Microscopic Structure.—The tumour is a spheroidal-cell carcinoma. In some parts the epithelial masses are large and the stroma scanty; in other parts there are large areas of dense fibrous tissue with very few epithelial masses.

From a woman, aged 47, who was married at 20 but had had no children. She came under the care of Mr. Godlee in December 1902, on account of shrinking of the left nipple, which had been noticed for a fortnight. The tumour was situated beneath and external to the nipple. The axillary glands were enlarged. The complete operation was performed. In 1904 there was no evidence of recurrence.

Atrophic Spheroidal-cell Carcinoma.

2283. A section of a breast which is the seat of carcinoma. The gland is very small, and is almost entirely replaced by a small shrinking tumour beneath the nipple, which is invaded by it. The nipple is not retracted, but part of the areola is covered with coarse papillæ, the corresponding part of the surface of the nipple being ulcerated. Part of the pectoral muscle is adherent to the deep aspect of the tumour and is drawn upwards into its substance by the shrinking of the growth. The cut surface of the tumour is slightly concave, grey in colour, and marked by fine white lines. 1200

Microscopic Structure.—The condition of the specimen renders microscopic examination unsatisfactory.

The specimen is a typical example of the atrophic form of carcinoma.

2284. An atrophied breast with the skin covering it and the surrounding fat, removed for atrophic carcinoma. The nipple is deeply retracted, its position being represented by a hollow with a small projection at the bottom. Radiating from this hollow are several deep wrinkles showing how the skin has been drawn together by the contracting growth. On one side of the nipple the skin is smooth over an area of 2·5 cm., where it is actually implicated in the growth. The section through the gland shows no recognisable mammary tissue. There is a small, exceedingly hard carcinoma extending from the skin to the pectoralis major; in this direction it measures only 1·5 cm., although there is a considerable amount of fat on each side. The fibres of the muscle are drawn up towards the growth, so that in the middle they are nearly at right angles to their normal direction. The cut surface of the tumour is concave, grey in colour, and marked by numerous white streaks and dots. 5700

This is a characteristic specimen of the atrophic form of spheroidal-cell carcinoma. The evidence of contraction of the growth and the consequent dragging together of the parts implicated is very marked. It was removed by Mr. Marshall from an old woman in whom it had been growing for twelve years.

Hard Spheroidal-cell Carcinoma without Retraction of the Nipple.

2285. A section of a breast removed by operation for carcinoma. On the surface of the section the line of demarcation between the breast-tissue and the surrounding fat is readily recognised; the nipple and the ducts passing into it from the breast are normal. In the outer extremity of the breast-tissue the section passes through a small hard growth, which can be readily distinguished from the surrounding fat, but in the present condition only differs in appearance from the section of the breast-tissue by its more dense texture and a slight difference in colour. The axillary fat has been removed in order to display a large number of secondary glandular deposits. 8845

Microscopic Structure.—The tumour is a spheroidal-cell carcinoma.

From a married woman, aged 53. The tumour was situated in the left breast beneath and external to the nipple. There was extensive glandular disease. Operation was performed by Mr. Godlee in Oct. 1901. Death occurred with extensive local recurrence in 1902.

2286. A section of a breast in which a carcinoma has originated at the axillary border of the gland. On the surface of the section the tumour, which has a diameter of 3·5 cm., can be readily distinguished from the breast-tissue and the fat; it projects slightly on the pectoral surface of the breast, and superficially extends to, but does not actually involve, the skin. The ducts of the breast are slightly dilated. The cut surface of the tumour presents the usual appearances of a hard carcinoma. 9056

Microscopic Structure.—The tumour is a spheroidal-cell carcinoma.

From a married woman, aged 45, who had had two children. She came under the care of Mr. Godlee in Oct. 1902, on account of a painless swelling in the upper and outer part of the left breast of six months' duration. The breast and axillary glands were removed; the latter were diseased. In Feb. 1903 there was local recurrence.

Spheroidal-cell Carcinoma producing a Tumour of the Nipple.

2287. Half a breast removed for carcinoma, the chief part of which infiltrates the nipple. The breast is small, and very little gland-tissue can be recognised on the surface of the section. The nipple forms a somewhat conical projection, 2·5 cm. in diameter; its surface is nodular and covered with thinned skin, and it is infiltrated throughout by growth which to the naked eye has a fine spongy structure. The nipple, although so much enlarged, is at the same time distinctly retracted. Beneath the base of the nipple a deeper part of the growth can be recognised, and is readily distinguished from the glandular tissue and fat by its grey colour. 6461

Microscopic Structure.—The tumour is a spheroidal-cell carcinoma. The alveoli are large and are separated only by slender fibrous trabeculæ.

From a woman under the care of Mr. Marcus Beck. There is no history to the specimen.

Spheroidal-cell Carcinoma with Invasion of the Skin.

2288. A breast which is the seat of a small hard carcinomatous tumour, together with the overlying skin; the deeper part of the gland has been removed by a section parallel to the skin, and the axillary fat has been dissected away to display the lymphatic glands, which are enlarged by deposits of growth within them. Over the outer part of the breast the skin presents numerous radiating furrows, caused by the shrinking of the tumour which lies beneath it. At a point 2 cm. from the nipple, where the retraction of the skin is most marked and from which the surrounding furrows radiate, the surface is slightly warty and apparently superficially ulcerated. The nipple is not retracted. On the posterior divided surface of the specimen the dense growth can be readily recognised; it measures about 2 cm. in diameter; its margin is easily defined from the surrounding fat, but is less clearly distinguishable from the breast-tissue. There is a general convergence of lines of fibrous tissue towards the tumour, indicating the traction on the surrounding tissues due to the shrinking of the tumour. 9297

Microscopic Structure.—The tumour is a spheroidal-cell carcinoma. In all parts, even where it is invading the fatty tissue, the growth maintains a very distinct acinous type. The alveoli are large and lined by a single layer of small spheroidal cells, within which much larger spheroidal cells are arranged either in an irregular mass or as a thick layer surrounding a distinct lumen. The stroma is densely fibrous.

From a woman, aged 49, who had had one child. In Jan. 1903 a lump was accidentally noticed in the right breast, but for some months previously the breast had been shrinking. In May 1903 Mr. Godlee performed the complete operation for a typical atrophying carcinoma in the upper and outer quadrant of the right breast. The axillary glands could not be felt before the operation.

2289. A slice of a breast, in which a carcinoma has invaded the skin. The tumour is small, and its cut surface shows the fine yellowish-white streaks so frequently seen in the hard form of spheroidal-cell carcinoma. The nipple has been retracted by the traction of the shrinking tumour on the ducts. Externally to the nipple the skin has been invaded by the growth; it is considerably thickened and its surface ulcerated. A section of one of the axillary glands shows it to be infiltrated by a growth similar in appearance to the primary growth. 8343

From a woman, aged 55, who was under the care of Mr. Christopher Heath in U. C. H. Five months before admission the patient first noticed pain in the left breast; a month later the breast became hard and swollen: it was treated with plasters and poultices, and later ulceration occurred. On admission the left nipple was retracted, the skin over the upper and outer quadrant was ulcerated, and a hard growth could be felt in the breast; the axillary glands were enlarged and hard. The breast and axillary fat and glands were removed. Three months later a local recurrence in the skin was excised, but appeared to be again recurring when the patient left the hospital a fortnight later. (Surg. Reg. Rep. 1900, p. 160, No. 2092.)

2290. A breast with part of the skin covering it, removed for carcinoma. The nipple is slightly retracted. At one end of the oval piece of skin removed, apparently over the axillary border of the breast, is a rounded area, reaching to within 1·5 cm. of the nipple, which is slightly depressed below the level of the surrounding skin and is for the most part smooth and surrounded by a well-marked furrow. Over part of the affected portion of skin the surface, instead of being smooth, is warty or coarsely papillary.

The section carried through the gland from the deep surface shows the whole mamma to be healthy, with the exception of the part corresponding to the diseased skin. In this place there is a tumour implicating the outer edge of the mamma, the skin, and the pectoral muscle, a piece of which has been removed. The cut surface of the tumour is smooth, evidently hard, and slightly concave. The tissues of the breast at the point nearest to the tumour seem drawn together, as if the growth had shrunk after implicating them. 4882 B

It is evidently a specimen of the shrinking or cicatricial form of carcinoma.

2291. A breast with the skin covering it, removed for carcinoma. The integument to the inner side of the nipple is implicated for an area of 4 cm. in diameter, the tumour forming a slightly raised projection above the level of the surrounding skin, the central part of which is nodular and furrowed. Ulceration has commenced, chiefly on the side farthest from the nipple, where there is a raw surface 1·5 cm. in diameter. The nipple is slightly retracted. An incision which has been made into the deep surface of the specimen displays a hard growth infiltrating the breast-tissue. 6204

Microscopic Structure.—The tumour is a spheroidal-cell carcinoma, with large irregular cell-masses and a scanty fibrous stroma.

From a single woman, aged 46, who was admitted into U. C. H. under the care of Mr. Marcus Beck, on March 25, 1886. She was a healthy-looking woman and well-nourished. She had noticed a lump in the right breast for two years and a half; it had caused little or no pain until shortly before admission, when ulceration of the skin took place, and the small raw surface bled freely. In the fresh state the projecting tumour formed a bluish-purple swelling traversed by small dilated vessels. A scab was adhering to the ulcerated surface. The axillary glands were considerably enlarged. The whole breast, with the axillary glands and fat, was removed, and the patient recovered rapidly. (Surg. Reg. Rep. 1886, p. 75, No. 567.)

2292. Half a large carcinoma of the breast with the surrounding skin, deeply ulcerated in its centre. The tumour measures 11 cm. in length by 5 cm. in greatest depth. The large cavity measures 5 cm. in diameter by 3 cm. in depth. Viewed from the skin-surface the nipple is seen to be healthy and not retracted; the edge of the ulcer reaches to within 2 cm. of it. The edges of the ulcer are raised above the surrounding skin, and at one point distinctly everted. Close to the margin of the cavity the granulations are exuberant and give the part a papillary appearance. The section shows the cavity to be irregular in shape; it is surrounded on all sides by growth, in most parts about 15 mm. in thickness. The substance of the tumour is firm, and grey in colour, with pale streaks of fibrous tissue running through it in various directions; it becomes softer and more uniform in tint near the ulcer. The margin of the tumour, where it is shown, is tolerably clearly defined, but the growth is not separable from the surrounding fat. No trace of mammary tissue can be recognised.

Microscopic Structure.—The condition of the specimen renders satisfactory examination impossible.

There is no history to the specimen.

Spheroidal-cell Carcinoma extending into the Pectoral Muscle.

2293. A section of a carcinomatous breast, together with the corresponding part of the pectoralis major and the axillary fat and glands. The growth forms a large mass, which appears to have entirely replaced the breast-tissue; its outline is well-defined, but is intimately connected with the surrounding fat. Beside the nipple, which is slightly retracted, the tumour forms a distinct prominence beneath the skin, but although adherent to the latter does not appear actually to involve it. On the deep surface of the gland the tumour extends through the fascia into the pectoral muscle and forms a layer 3 cm. in thickness, in parts of which the unaltered muscular tissue can still be recognised. The section of the axillary contents shows numerous lymphatic glands, enlarged by a deposit of new growth, presenting an appearance similar to that of the tumour in the breast. 8372

Microscopic Structure.—The tumour is a spheroidal-cell carcinoma. The fibrous stroma is abundant and dense. The epithelium-cells are arranged in narrow columns.

From a woman, aged 56, who was under the care of Mr. Barker in U. C. H. in Dec. 1899. The disease had been noticed six months. There was a large hard tumour of the right breast, adherent to the skin and fixed to the chest-wall; the nipple was retracted; enlarged glands could be felt in the axilla. The breast, together with the skin covering it, a large part of both pectoral muscles, and the axillary fat and glands, was removed. The patient left the hospital a month after the operation. Death occurred two months after the operation, probably from internal recurrence. (Surg. Reg. Rep. 1900, p. 154.)

Spheroidal-cell Carcinoma with Secondary Deposits in the Lymphatic Glands.

2294. Half a breast, which is the seat of a carcinomatous growth, together with the axillary and supraclavicular lymphatic glands, which are much enlarged by secondary deposits of the growth. On the surface of the section it is seen that the breast is extensively invaded by the new growth, only a small part of the unaltered breast-tissue remaining in the axillary (lower) half of the section. The line between the tumour and the surrounding fat is clearly defined, but that between the tumour and the remaining breast-tissue is indistinct, the two being only distinguished by the greater density and coarse granular appearance of the growth. Superficially the tumour extends as far as the base of the nipple, which is thickened but not retracted. The deep surface of the growth is separated by a thin layer of healthy-looking fat from the pectoral muscle. The largest of the axillary glands measures 6 cm. in length. The supraclavicular glands are mounted at the upper part of the specimen. 9417

Microscopic Structure.—The tumour is a spheroidal-cell carcinoma. The alveoli are small and are grouped in a manner suggestive of the grouping of the breast-acini to form lobules. In some parts alveoli filled with spheroidal cells lie side by side with unaltered breast-acini. The stroma of the tumour is very cellular.

From a married woman, aged 50, who came under the care of Mr. Godlee in Nov. 1903. on account of a tumour in the upper and inner quadrant of the right breast. The axillary and supraclavicular glands were enlarged. The tumour was first noticed in July 1903. The complete operation was performed and the supraclavicular glands also removed.

2295. A section of a breast removed by operation for carcinoma, together with secondary deposits in the axillary and supraclavicular glands. On the surface of the section, which has been carried through the breast close to the nipple, the healthy-looking gland-tissue is readily recognised. At the sternal end of the gland is a small, hard, carcinomatous tumour, 18 mm. in its longest diameter; its deep surface is in contact with the pectoral fascia. The lymphatic vessels and glands of the axilla have been dissected: the latter are enlarged by secondary deposits of growth, the largest gland being nearly 2·5 cm. in length. Above the breast are several glands which were removed from above the clavicle. 9487

Microscopic Structure.—The tumour is an unusual form of spheroidal-cell carcinoma. It is divided up by fibrous trabeculæ radiating irregularly from its centre; with the trabeculæ is connected a delicate reticulum enclosing alveoli filled with epithelium-cells. The alveoli are small, and in some the epithelium encloses a central lumen. The growth is an example of the acinous form of carcinoma.

From a married woman, aged about 50. The complete operation was performed and the supraclavicular glands also removed.

Diffuse Spheroidal-cell Carcinoma.

2296. A slice of part of a breast which was the seat of a diffuse carcinoma. Extending irregularly through the fat, the tumour is readily recognisable. The growth shows very clearly the yellowish-white spots so frequently seen on the cut surface of a hard spheroidal-cell carcinoma, and due to masses of epithelial cells. 8297

There is no history to the specimen.

Soft Spheroidal-cell Carcinoma.

2297. A section of a breast, which is the seat of a carcinomatous tumour, prepared with formalin. The tumour, which is nearly circular in outline and 3·5 cm. in diameter, involves the whole thickness of the gland, slightly projecting beneath, but not actually implicating, the skin. The nipple is slightly retracted, and beneath it the remains of the breast-tissue can be recognised. The tumour-substance is of a dull yellowish-grey colour, except in those parts of the growth into which hæmorrhage has occurred. 8329

Microscopic Structure.—The tumour is a very cellular spheroidal-cell carcinoma.

From a married woman, aged 62, who had noticed a lump in the left breast for a year; the tumour was painless, but the patient complained of a feeling of weakness in the left arm. There was a hard tumour 2½ inches in diameter in the upper and outer quadrant of the left breast; the nipple was not retracted; the skin over the tumour was raised and, over two projecting nodules, slightly bluish in colour; two large glands could be felt in the axilla. The breast, together with the fat and glands of the axilla, was removed on Oct. 16, 1899.

2298. Half a breast with the skin covering it and the nipple, removed for a carcinomatous tumour. The skin is healthy and the nipple not retracted. The section shows a large tumour about 8 cm. in its longest diameter. The part near the nipple is hard and smooth on section, and its outline is very badly defined from the neighbouring fat which it is invading. The greater part of the tumour is softer in structure, the cut surface presenting a granular appearance. The edge of this part is more clearly defined, but there is no capsule, nor can it be separated from the surrounding fat.

Microscopic Structure.—The tumour is a soft spheroidal-cell carcinoma. The alveoli are large and filled with cells not larger than those ordinarily met with in cancer of the breast. The stroma is very small in amount. The tumour has undergone advanced fatty degeneration in the softer part, so that its structure is no longer recognisable.

2299. A slice of a soft carcinoma of the breast, together with the skin covering it. The tumour measures 9 cm. in diameter; it is very soft and friable, and in the peripheral parts subdivided into lobules by delicate fibrous septa. The central part of the growth is extensively degenerated. The outline of the tumour is well defined, but there is no fibrous capsule. In its most superficial part the tumour is in contact with the skin, which is slightly thinned over it. 5896

Microscopic Structure.—The tumour is a carcinoma. The spheroidal cells are arranged in very large alveoli and the stroma is scanty.

From a woman, aged 62, who was under the care of Mr. Marshall in U. C. H. in 1883. A tumour of the right breast had been noticed for six months, and for three months had been the seat of severe shooting pain; there was a history of a blow on the part about five years previously. On admission there was a large tumour of the right breast, which appeared to involve the pectoral muscle; the nipple, which was flattened and covered with dried discharge, was situated at the outer border of the tumour; the overlying skin was smooth and shiny, and in parts reddened; the superficial veins were enlarged; the growth extended upwards towards the axilla, but no enlarged glands could be felt. The breast was removed on March 3, part of the wound being left to heal by granulation. The patient left the hospital on April 2. There are no notes of the subsequent history. The case is included in the Hospital Reports as one of sarcoma. (Surg. Reg. Rep. 1883, p. 96, No. 426.)

2300. A section of a breast the seat of a carcinoma which has ulcerated through the skin. On the surface of the section the tumour-substance almost entirely replaces the breast-tissue and consists of lobules of soft granular growth. Superficially the tumour extends through the skin in the form of a raised fungating mass with prominent everted edges, in which the margin of the skin surrounding the projecting ulcerated growth can be readily traced. The surface of the protruding mass is irregular and stained by hæmorrhage, and in its central part presents an irregular excavation. 7689

Microscopic Structure.—The tumour is a very soft spheroidal-cell carcinoma. The cell-masses are large and the intervening stroma scanty.

There is no history to this specimen.

Colloid Carcinoma.

2301. A slice of a colloid carcinoma of the breast. The upper part of the tumour is solid and shows no structure recognisable to the naked eye; the lower part is alveolar in structure, having somewhat the appearance of a sponge. The middle part of the slice contains a few alveolar spaces scattered through a tissue of the same character as that forming the upper part. The contents of the spaces, which in the recent state consisted of a jelly-like material, have disappeared. At the lower part of the specimen is some of the fat surrounding the mamma which is being invaded by the cancer. 3544

From a woman, aged 50, who was under the care of Mr. Avery, in Charing Cross Hospital in 1841. About three years previously she had noticed a tumour as large as a hazel-nut in the right breast, and before this had had some pain in the breast and a bloody discharge from the nipple. There were no palpable glands in the axilla. The breast was removed. Four years later there was extensive recurrence in the scar and in the axilla.

2302. A colloid carcinoma of the breast in section. On the surface of the section no breast-tissue can be seen, and the tumour, except where it is in contact with the skin, is surrounded at all parts by healthy-looking fat. The cut surface of the tumour measures 6 cm. by 4 cm.; it has a mottled appearance, due to the presence of dark red hæmorrhagic patches mixed with a semitransparent, grey, gelatinous substance and with other areas which are opaque, yellowish in colour, and finely granular. The skin covering the tumour is thinned and slightly raised; its surface is nearly smooth, slightly lobulated, and the dark tumour-substance shows distinctly through it. 8085

Microscopic Structure.—The tumour has the typical structure of a spheroidal-cell carcinoma with colloid degeneration.

From a married woman, aged 73. The duration of the growth was not recorded. The patient was extremely fat and the breasts were enormous. In the centre of the left breast was a tumour measuring $2\frac{1}{2}$ by 3 inches; it was firm in consistence but not hard, and its outline was well-defined; the skin over the tumour was thin and blue, and raised in low smooth prominences, the most marked of which represented the remains of the nipple. The breast was removed in Sept. 1898, but the axilla was not opened. About two years after th operation the patient was in good health.

2303. A breast, which is the seat of a colloid carcinoma. An incision has been made into the deep aspect of the tumour to display the translucent jelly-like substance into which the growth has degenerated. The tumour measures 4 cm. in its longest diameter, and contrasts strongly with the surrounding opaque-white breast-tissue. The nipple lies over one extremity of the tumour, and is retracted. The axillary glands show no evidence of disease. 9454

From a married woman, aged 74, who came under the care of Mr. Godlee in Dec. 1903 on account of a tumour of the right breast which had been noticed for one week. The tumour occupied the upper and outer quadrant, and had the characters of a rather soft carcinoma; the axillary glands were enlarged. The complete operation was performed.

2304. A section of a breast, which is the seat of a colloid carcinoma. The tumour, which is situated centrally, measures 5·5 cm. in diameter; the outline of the tumour, although irregular, is well defined and readily distinguished from the surrounding fat, in which the remains of the breast-tissue can be seen. The superficial surface of the tumour is in contact with the skin, which is raised and thinned over it. Viewed from the surface the area of skin which covers the growth forms a slightly nodular, almost smooth swelling surrounded by a deep furrow and including the flattened nipple. The section of the tumour presents, in part, especially peripherally, a dense fibrous-looking structure; in other parts the tumour-substance is grey in colour and semitranslucent, appearing to consist of a jelly-like material filling the spaces of an irregular reticulum. The axillary glands, which were removed, did not present to the naked eye any appearance of disease. 8642

Microscopic Structure.—In many parts the tumour has the typical structure of a spheroidal-cell carcinoma, whilst in other parts the alveoli are distended by a structureless material which, as the result of the action of hardening reagents, appears as a fine network. In some of the alveoli the cells have only partly undergone the colloid change.

There is no history to the specimen.

2305. A section of a breast, which is the seat of a colloid carcinoma. The tumour can be readily distinguished on the surface of the section; it is rounded, and measures 2 cm. in diameter; it projects slightly on the deep aspect of the breast and also beneath the skin, which is not, however, actually invaded by the growth. The outline of the tumour is at all parts well defined; the central part of the section of the growth has an almost gelatinous appearance, but the peripheral part, for a thickness of about 4 mm., is dense and opaque white in colour. The tumour lies in the outer half of the breast, and the nipple, which is separated from it by a distance of 2 cm., is slightly retracted. 9347

Microscopic Structure.—The tumour presents in parts the structure of a spheroidal-cell carcinoma. In many places the cells and stroma of the tumour have undergone degeneration; the cells remain unstained and the stroma is changed into a very open fibrillar meshwork, which is probably infiltrated with colloid material.

2306. A slice of a breast containing a colloid carcinoma. The incision has been carried through the nipple, which is seen in section; it is slightly depressed, apparently rather by the elevation of the tissues surrounding it than by retraction of the nipple itself. Beneath the nipple and extending to the limits of the specimen in all directions is a tumour of irregular form infiltrating the surrounding tissues. No mammary tissue can be recognised, but here and there some fat remains unaltered and invaded by processes of the tumour. The section shows a fine alveolar structure more marked in some parts than in others, the meshes of which are filled with a semitranslucent substance. 3717

From a single woman, aged 35, who was under the care of Mr. Quain in U. C. H. in Nov. 1847 Two years previously a lump was noticed in the right breast and gradually increased. On admission the skin was adherent to the tumour and the nipple retracted; there was an enlarged gland in the axilla. The breast was removed. In March 1848 there were two hard nodules of recurrent growth in the upper part of the cicatrix and the axillary glands were still enlarged.

2307. Half a colloid carcinoma of the breast with the skin covering it. The tumour is irregularly circular in form, and measures about 5 cm. in diameter. Superficially it has implicated the skin in an area about 3·5 cm. in diameter. In the middle of this the tumour projects through the skin, probably in the position of the nipple, as a pedunculated growth, through which the section has been carried. The projection has a delicate spongy structure, and its surface is composed of soft and irregularly rounded papillæ. The cut surface of the tumour shows an alveolar structure, the alveoli being clearly visible to the naked eye. The stroma forming the walls of the alveoli is scanty. The spaces are filled with a transparent jelly. At the deep part, at the end farthest from the projecting superficial growth, the tumour is much firmer in structure, and presents the solid appearance of an ordinary hard carcinoma. The outline of the tumour is sharply defined, but there is no distinct capsule separating it from the surrounding fat. No healthy mammary tissue is shown in the specimen.

The tumour was removed from the breast of an elderly woman by Sir J. Erichsen. It had grown slowly, having been noticed for about two years. The projecting part of the tumour was covered by an adherent brown scab.

2308. A breast, with part of the skin covering it and the nipple, removed for a colloid carcinoma growing from one side of the gland; the nipple is preserved at one edge of the piece of skin, but is scarcely recognisable, being flattened out by the growth beneath it. In the middle of the skin is a round opening, 1 cm. in diameter, with ulcerating edges. A section has been carried through the tumour and the opening in the skin. The tumour is oval in form, measuring 5 cm. in its longest diameter. Superficially it is inseparably blended with the skin; elsewhere it is separated from the surrounding tissues by a layer of condensed areolar tissue, which does not, however, form a definite capsule. The structure of the tumour is extremely soft, but here and there are bands of denser tissue dividing it into lobules, some of which present a gelatinous appearance. In the centre it is broken down into a ragged cavity, which communicates with the opening in the skin. The rest of the mammary gland is healthy. In the fresh state the whole tumour was of a dark red colour, and so soft that it broke down under the slightest pressure. The cavity was filled with a clot of blood mixed with broken-down fragments of the tumour. 5811

Microscopic Structure.—The tumour presents very irregular masses of epithelium-cells, widely separated by a faintly staining fibrillated substance. In many of the epithelial masses the cells are partly degenerated into a substance which appears as a clear globule in the centre of the mass.

The tumour was removed by Sir J. Erichsen from a very feeble woman, aged about 65. It formed slowly and without pain. The surgeon who first saw it took it for a cyst on account of its great softness and evident fluctuation. It was accordingly punctured with a lancet, but nothing but blood escaped. The opening gradually increased by ulceration and much hæmorrhage took place, which was with difficulty arrested by pressure and styptics. The breast was then removed by Sir J. Erichsen, and the patient made a rapid recovery.

The patient remained free from recurrence for three years. Several small nodules, similar to the primary growth, then appeared in the cicatrix. She refused further operation, and when last heard of the tumour was extending towards the axilla, and a fatal termination seemed imminent. The specimen was originally described as a soft sarcoma.

Spheroidal-cell Carcinoma associated with the Presence of Fibro-adenoma, Duct-papilloma, and Cyst.

2309. A slice of a breast, together with the overlying skin including the nipple, the gland being the seat of a carcinoma and of a small fibro-adenoma which lies in contact with it. On the surface of the section the carcinomatous tumour measures 7 cm. by 5 cm. and involves the whole thickness of the gland, raising the skin around the nipple but not actually invading it. Partially embedded in the deep aspect of the carcinomatous tumour is another small encapsuled tumour, which contrasts with it by its more fibrous appearance and whiter colour. The surface of that portion of the smaller tumour, which is not embedded in the larger one, is in contact with part of the breast-tissue. 6904

Microscopic Structure.—The larger tumour is a spheroidal-cell carcinoma. The smaller tumour is a fibro-adenoma.

From a woman, aged 51, who was admitted into U. C. H. under the care of Mr. Heath on Sept. 19, 1892. She began to experience pain in the chest in the preceding March, and a lump was detected in the left breast in June. The tumour had the ordinary clinical features of a moderately hard carcinoma. The breast was removed together with the axillary fat and glands. (Mr. Heath's *Case-books*, 1892, vol. ii, p. 226.)

2310. A section of a breast which is the seat of a small hard nodular carcinoma and two small fibro-adenomata. The carcinoma occupies the part of the breast immediately beneath the nipple and has extended into the substance of the latter, forming an oval extension of the growth measuring 2·5 cm. by 1·5 cm. It is evident that the nipple besides being infiltrated by the tumour has been considerably retracted, for its surface scarcely projects beyond that of the surrounding skin and it is surrounded by a deep sulcus. The part of the tumour which lies beneath the nipple is dense and its cut surface is marked by yellowish-white streaks; the part which involves the nipple is softer and granular. Loosely connected with the deep surface of the breast in the immediate neighbourhood of the tumour above described are two small hard fibro-adenomata, the larger of which has a maximum diameter of 18 mm. 6804

Microscopic Structure.—The deep portion of the carcinoma has the usual structure of a spheroidal-cell carcinoma. In the part of the growth which involved the nipple some alveoli are filled with spheroidal cells, but many are lined by a single layer of columnar cells. One of the small tumours on the deep surface of the breast has the typical structure of a fibro-adenoma.

From a woman, aged 61, who was under the care of Mr. Beck in U. C. H. in 1891. There had been a painless gradually increasing lump in the right breast for two years, and before this time the nipple had been noticed to be retracted. The right breast and axillary fat and glands were removed; the latter did not appear to be diseased. A small fibro-adenoma was also removed from the left breast. (Surg. Reg. Rep. 1891, p. 224, No. 1814, and Trans. Path. Soc. vol. xliii, 1892, p. 120.)

2311. A breast, in which a duct papilloma is associated with the presence of a spheroidal-cell carcinoma. An incision, which has been made into the deep surface of the gland, displays an ovoid cyst nearly filled with a delicate papillary growth. The cyst measures 14 mm. in its longest diameter, and in the left half the broad base of attachment of the intracystic growth can be seen. The breast-tissue around the cyst is condensed, and several minute cysts can be seen on the divided surface, but with the naked eye no definite evidence of new growth can be recognised.

Microscopic Structure.—Examination of the specimen by the Morbid Growths Committee of the Pathological Society showed it to be a spheroidal-cell carcinoma. A growth of this structure was found in the tissues around the cyst in which the papillomatous growth is situated.

From a woman, aged 40, who was admitted into U. C. H. under the care of Mr. Berkeley Hill in 1890. For eighteen months there had been a discharge from the right nipple, which was at first milky but later became blood-stained. On admission a small, ill-defined, hard lump could be felt in the upper and outer quadrant of the breast; there was a clear blood-stained discharge from the nipple and pressure over the lump increased the amount of discharge and rendered it more blood-stained; the nipple was not retracted, but was loosely held to the tumour; there were no palpable glands in the axilla. The breast was excised (Surg. Reg. Rep. 1890, p. 94, No. 1105). In Dec. 1894 a small lump was noticed close to the scar, and in Aug. 1896 the patient was re-admitted to U. C. H. There were two recurrent growths near the outer end of the scar, the larger having the size of a small egg. The tumours were removed with a piece of the overlying skin, the surrounding fat, and the superficial part of the pectoral muscle. The tumours presented in parts a gelatinous appearance and microscopically showed the structure of spheroidal-cell carcinoma undergoing colloid change. (Surg. Reg. Rep. 1896, p. 54, No. 7141.)

In July 1897 another recurrent growth, as large as a pigeon's egg, beneath the scar of the previous operation, was removed. At this time the patient complained of pain in the right hip and down the leg. From this time the patient gradually became cachectic, a troublesome cough developed, with expectoration sometimes tinged with blood; the liver became enlarged, nodular, and painful. For three months before death, which occurred in Jan. 1898, there was intense headache, and a circular depression, which gradually increased in size, formed in the right half of the frontal bone; the edges of the depression were rough and irregular, but in the depression itself the bone was completely absorbed, so that the pulsations of the brain could be felt; the overlying skin was normal. For two months before death, a tumour, which gradually attained a large size, formed at the junction of the manubrium with the body of the sternum. At the *post mortem* examination secondary deposits were found in the sternum, liver, lungs, and skull; in the latter the growth infiltrated the bone around the large perforation above described. The secondary growths were spheroidal-cell carcinomata, those in the lung and sternum only showing colloid degeneration. (Trans. Path. Soc. vol. xlix, 1898, p. 303.)

2312. A section of a breast, which is the seat of a large cyst and of a small hard carcinoma. The cyst, which extends up to the centre of the breast, has a maximum diameter of 4 cm., its deep surface reaching to the fascia covering the deep surface of the gland. In its deeper half the wall of the cyst is thin and its inner surface smooth; in its superficial part the inner surface of the cyst is raised, nodular, and irregular, and a section which has been made of this part of the wall shows that it has a thickness of 8 mm. and is formed by solid growth lying in intimate connection with the surrounding fat. The nipple, which lies near the inner end of the cyst, is slightly retracted. Separated from the outer end of the cyst by fatty tissue 2·5 cm. in thickness is a small hard growth 1·5 cm. in diameter, intimately connected with the surrounding fat and superficially involving the skin, which is thickened and drawn down into the growth. Connected with the outer end of the specimen is part of the axillary fat, through which a section has been made to display several lymphatic glands enlarged by deposits of new growth; the central part of one of these glands has been replaced by a deposit of fat. 8900

Microscopic Structure.—The tumour is a spheroidal-cell carcinoma; the epithelium-cells are arranged chiefly in slender columns and lie in an abundant and very dense fibrous stroma. A lymphatic gland which was examined is infiltrated throughout with masses of epithelial cells.

There is no history to the specimen.

COLUMNAR-CELL CARCINOMA OF THE BREAST.

This form of cancer of the breast is rare. It has received the names of "duct-carcinoma" and "villous carcinoma." The tumour is most commonly situated about the central part of the gland; it is much softer than the common form of nodular carcinoma, and evidences of shrinking of the tumour are usually wanting. Examined with the naked eye the tumour usually presents a more or less definitely cystic structure, the spaces being occupied by vascular papillomatous growth (2315). This structure explains the blood-stained discharge from the nipple, which is a common symptom of the disease. The essential difference between the villous form of carcinoma and a simple duct-papilloma is, that in the latter the growth is entirely confined to the interior of a dilated duct, whilst in the carcinoma the growth extends from the duct into the tissues around it in the form of spaces lined with columnar epithelium. Columnar carcinoma of the breast does not always assume the villous form, but may be met with as a growth, which cannot with certainty be distinguished by naked-eye examination from the spheroidal-cell carcinoma (2314).

The disease runs a much less malignant course than the spheroidal-cell carcinoma, and invasion of the lymphatic glands is exceptional.

2313. A piece of a breast, into which a section has been made to display a small tumour, about 13 mm. in diameter. The tumour is soft and surrounded by a well-marked fibrous capsule, from which in parts it can be so readily separated as to suggest that it is an intracystic growth. The surrounding breast-tissue does not show to the naked eye any definite evidence of disease. 9492

Microscopic Structure.—The tumour consists of a meshwork of irregular spaces lying in a delicate cellular, and very vascular, stroma. Into many of the spaces irregular papillary processes project; the epithelium lining the spaces is in many parts a single layer of cubical or low columnar cells; in other parts the lining epithelium has proliferated into considerable masses of spheroidal cells, which may almost entirely occupy the lumen of the spaces. These microscopic appearances would be compatible with the view that the tumour is a simple duct-papilloma. Examination, however, of a section taken from the breast-tissue outside the capsule of the tumour shows that growth of a similar structure is present. The tumour must therefore be regarded as a small columnar-cell (duct) carcinoma.

From a woman, aged 51, who had had several children. A lump in the left breast was accidentally noticed in Oct. 1903. In Feb. 1904 there was a small hard lump in the lower and outer quadrant of the left breast; the axillary glands could not be felt. The lobe of the breast containing the tumour was excised by Mr. Godlee, and after noting the character of the tumour the whole breast was removed.

2314. A breast, in which a spheroidal-cell carcinoma is associated with extensive cystic change; in the wall of one of the cysts a columnar-cell carcinoma has originated. The section which has been made displays a large cyst about 7 cm. in diameter, the interior of which is lined with a brownish layer of shreddy material, probably resulting from hæmorrhage into its interior. From the deep aspect of the cyst an irregular nodular growth projects into the lumen. In another part of the section a smaller cyst has been opened and is occupied by a small pedunculated intracystic growth. The part of the breast-tissue immediately adjacent to this cyst is occupied by a solid tumour 3·5 cm. in diameter; the outline of the tumour is well-defined, but the growth is intimately connected with the surrounding fat; the section displays a dense slightly fibrous structure. The skin covering the large cyst above described is the seat of an ulcer 2 cm. in diameter. 8407

Microscopic Structure.—The solid tumour is a spheroidal-cell carcinoma, presenting large irregular alveoli, separated by a scanty fibrous stroma. The irregular nodular growth in the wall of the large cyst has an irregular papillary structure and consists of spaces into which irregular papillomatous outgrowths, covered with columnar epithelium, project; in the more solid parts of the growth are smaller spaces lined with columnar epithelium or filled by more spheroidal cells. The base of the growth extends so irregularly into the wall of the cyst that it must be regarded as a columnar-cell carcinoma.

From a woman, aged 76, in whom a tumour of the left breast had been known to exist for three years. The breast was much enlarged and, in parts, evidently cystic; the skin over the lower part presented a superficial ulcer; the nipple was retracted. In some parts of the enlarged gland more solid areas could be felt. The whole breast was removed. (Surg. Reg. Rep. 1900, p. 106, No. 166.)

2315. A section of a duct-carcinoma of the breast, together with the overlying skin, which does not, however, include the nipple. On the surface of the section the tumour measures 5 cm. in its longest diameter. The outline of the tumour is readily distinguishable from the surrounding fat, but there is no capsule between them. In one situation where some of the breast-tissue remains the limit of the growth is less defined. Superficially the tumour extends to, but does not involve, the skin. The section of the growth displays solid and cystic portions; the former has a granular appearance; the cystic part presents irregular spaces bounded by the tumour-substance, which forms small irregular papillary projections. 7688

Microscopic Structure.—The tumour is a columnar-cell carcinoma. One of the main ducts contained a separate small intracystic growth.

From a married woman, aged 53, who for eight or nine months had experienced a pricking sensation in the left breast. A few weeks after the onset of the pain a discharge from the nipple commenced and a hard lump was detected in the breast. On admission into U. C. H. there was a hard rounded tumour in the upper part of the left breast; its outline was indistinct and it was intimately connected with the breast-tissue; the overlying skin was slightly œdematous and loosely adherent to the tumour; at two spots the tumour projected prominently, the larger projection being cystic. The tumour moved freely on the pectoral muscle. One small gland could be felt at the inner part of the axilla. The breast, together with the axillary fat and glands, was excised; but no deposits were found in the glands. (Surg. Reg. Rep. 1890, p. 101, No. 2121.)

CARCINOMA OF THE BREAST WITH PAGET'S DISEASE OF THE NIPPLE.

2316. A breast with the skin covering it, removed by operation for carcinoma associated with Paget's disease of the nipple and areola. The tumour has been displayed by the removal of part of the gland. The disease of the nipple and areola presented in the fresh state the following appearances :—The nipple was completely retracted and had disappeared; an eczematous patch replaced and spread slightly beyond the limits of the normal areola; the patch was dusky red in colour and presented over its surface many small scales, the red colour being most marked where the scales of epidermis had separated. In its present condition the diseased area can only be recognised by its pale colour and a zone of dark pigmentation which in part surrounds it. The tumour, which occupies the inner part of the breast, is 5 cm. in diameter, and presents on its divided surface the characteristic appearances of a moderately hard carcinoma. 8158

Microscopic Structure.—The tumour is a spheroidal-cell carcinoma.

From a woman, aged 51, who was admitted into U. C. H. under the care of Mr. Godlee, on Dec. 5, 1898. The disease of the nipple and areola was of long standing, and in Oct. 1896 it was noted by a medical man that there was a patch of "weeping eczema," as large as the index finger-nail, below the left nipple; at that time the nipple was not retracted and no induration could be felt in the breast. The tumour was first detected five or six months before the patient's admission. On admission the nipple and areola were in the condition above described; a firm tumour as large as a small orange was situated in the inner half of the breast; the axillary glands were enlarged. The breast, together with part of the pectoral muscle and the axillary fat and glands, was removed. (Mr. Godlee's *Case-books*, 1899, vol. ii, p. 479.)

2317. Half a breast, the seat of a carcinomatous tumour, together with half the nipple and surrounding skin, which is the seat of Paget's disease. The tumour is entirely situated to one side of the nipple and extends through the whole thickness of the gland, having a maximum diameter of 3·5 cm. The nipple is retracted and tilted by the drawing of the ducts into the adjacent part of the growth. Superficially the tumour extends up to, but does not actually involve, the skin. The disease of the areola and surrounding skin involved in the complete specimen a circular area about 6 cm. in diameter, extending more or less equally round the nipple. In the present condition the limits of the affected area are marked by a well-defined line; it is smooth, and in this respect contrasts with the wrinkled skin around; it is slightly discoloured and presents a slightly mottled appearance due to the presence of small irregular whiter areas in which the cuticle still remains. 6998

Microscopic Structure.—The tumour is a spheroidal-cell carcinoma. The alveoli are large and the stroma richly cellular.

From a married woman, aged 63, who had had eleven children. She had noticed soreness of the right nipple for ten or eleven years. The duration of the tumour was not known. The axillary glands were enlarged. Operation was performed by Mr. Godlee in June, 1893; there was no evidence of recurrence four months later.

2318. A carcinoma of the breast removed by caustics and subsequently dried. The piece removed is circular in outline. Some remains of the skin can be recognised on the convex surface. It is marked by incisions extending deeply into the mass removed. 5415

The method adopted was probably, first, the application of fuming nitric acid to the skin, then deep incisions were made through the eschar in the skin, and strips of lint covered with chloride of zinc paste introduced. These were renewed daily, the incisions being at the same time deepened until the action of the caustic was supposed to have extended beyond the disease. The dead tissues were then allowed to separata by suppuration, and the wound healed by granulation.

2319. A specimen similar to the preceding, preserved in spirit. In the section the bands of fibrous tissue are still recognisable. The fat forms cheesy masses apparently saponified. 5372

This specimen and the preceding one are of only historical interest.

2320. A carcinoma of the breast removed by operation, with the skin covering it. There is a deep ulcer with abrupt and somewhat ragged walls. It measures about 2·5 cm. in diameter; the edges are very slightly raised above the surrounding skin. 4096

The breast was removed by Cline in the year 1799. The small size of the mass removed is to be noted. It illustrates the practice, at one time not uncommon, of removing only the part of the breast which was evidently diseased.

Carcinoma of the Male Breast.

Except in its comparative rarity, carcinoma of the male breast differs in no respect from the disease in the female. The tumour is almost always of the spheroidal-cell form, but columnar-cell carcinoma of the male breast has been met with.

2321. A section of a male breast and of a carcinoma of the border of the lower and inner quadrant. The section of the gland measures 8·5 cm. in length and 2 cm. in maximum thickness, beneath the nipple. The tumour, which measures nearly 3 cm. in its longest diameter, is very loosely connected with the border of the breast; its outline is well defined; superficially it is commencing to involve the skin, and deeply a small piece of the pectoral muscle is loosely adherent. The nipple is not retracted. 7237

Microscopic Structure.—The tumour is a spheroidal-cell carcinoma. The alveoli are large and in many parts are only separated by slender fibrous trabeculæ.

From a man, aged 45, in whom a tumour of the right breast had been noticed for eighteen months. Both breasts had been abnormally large since boyhood. The breast and axillary fat and glands were removed. Seven weeks later a recurrent growth in the scar was excised. (Surg. Reg. Rep. 1894, p. 14, No. 1298.)

2322. Half a male breast, removed for carcinoma. The tumour is situated beneath and a little to one side of the nipple. The skin covering it is apparently healthy, and the nipple, although surrounded by a slight furrow, is not actually retracted. The tumour is almost globular in form, and its outline is clearly recognisable. It seems to implicate the skin in the immediate neighbourhood of the nipple. The cut surface is smooth and coarsely alveolar in structure. 2386

From a patient under the care of Mr. Liston.

2323. A male breast with the surrounding fat and the overlying skin, removed for carcinoma. In the centre of the skin is an irregularly oval ulcer measuring 3 cm. by 2 cm. The edges are raised slightly above the surrounding skin. The floor of the ulcer is depressed and irregular. The nipple has been completely destroyed by the ulcer. An incision has been carried through the specimen. The tumour extends to the fascia covering the pectoralis major muscle, a few fibres of which are adherent to the under surface. The cut surface of the tumour is slightly concave. The edge of the growth extends in irregular processes into the surrounding fat. The growth is grey in colour and coarsely alveolar in structure. 5311

Microscopic Structure.—The tumour is a "scirrhous cancer."

The patient was under the care of Mr. Marshall, in U. C. H., in February 1868. The tumour had been growing for eighteen months. The patient recovered from the operation and was in good health eight months later.

2324. Half the parts removed for carcinoma of the male breast. The tumour presents the characteristic appearance of a hard carcinoma, and measures nearly 3 cm. in diameter. Superficially it involves the nipple and the surrounding skin, and deeply extends to the fascia on the deep surface of the breast, but does not actually involve the pectoral muscle. The section of the axillary fat passes through a lymphatic gland 15 mm. in diameter, which is the seat of a secondary deposit of growth. 9522

Microscopic Structure.—The tumour is a spheroidal-cell carcinoma.

INJURIES AND DISEASES OF THE SKIN, SUBCUTANEOUS TISSUES, AND FASCIÆ.

The specimens in this series include chiefly those diseases of the skin which are treated surgically. The various skin-eruptions are illustrated by a special series of wax models and specimens.

INJURIES OF THE SKIN.

2325. A large thorn partly embedded in a mass of inflamed fibrous tissue. 8672

From beneath the skin of the thenar eminence. The foreign body was surrounded by a few drops of pus.

2326. An epithelial cyst removed from beneath the skin of the thenar eminence. It measures nearly 1 cm. in diameter and consists entirely of epithelium, the outer layers of which form a dense layer resembling a cyst-wall. 6907

From a boy aged 7½, who two and a half years previously had fallen in the road and cut his hand in the position from which the cyst was afterwards removed (Trans. Path. Soc. vol. xliv, 1893, p. 146). Cysts of this nature following wounds of the skin have been called "implantation dermoids"; they usually result from a punctured wound and doubtless arise from a fragment of epithelium displaced into the subcutaneous tissue. Similar cysts have been found in the iris following wounds of the cornea.

2327. A portion of a bowie-knife, 7·5 cm. long and 2 cm. wide, removed from the back of a man. It is black in colour, and corroded on the surface. 5233

The man was stabbed during the "solution of a difficulty" in New Orleans, and was at once carried to the hospital spitting blood and in a very dangerous state. He remained in hospital three months, and then worked his passage to England as a common sailor; but finding that a little sore remained unhealed he entered the workhouse hospital at Southport to get it attended to. Something hard was felt at the bottom of the sinus, which opened below the left scapula. It was cut down upon by Dr. F. D. Fletcher, and with some difficulty this portion of a knife was extracted. It lay between the lower angle of the scapula and the ribs. The patient had no idea that it was there.

2328. A needle, 7·5 cm. in length, removed from the abdominal wall. It is roughened and black on the surface.

2329. Eighty needles and a pin, removed at different times through the skin of an epileptic woman. 7738

The needles were all removed from the left side of the body, but there was no hemianæsthesia. The patient was never detected in the act of introducing them. No serious results were noted. (Bastian, Clin. Soc. Trans. 1892, vol. xxv, p. 88.)

INFLAMMATION OF THE SKIN AND SUBCUTANEOUS TISSUES.

The various simple inflammatory affections of the skin can only be illustrated very incompletely by museum specimens. The following specimens are chiefly examples of some of the different forms of ulceration.

2330. The lower part of a right leg and part of the foot showing a very extensive chronic ulcer completely surrounding the limb. The lowest limit of the ulcer is on a level with the upper part of the heel and the greatest longitudinal measurement is nearly 18 cm.: the ulceration is least extensive in the anterior aspect of the limb, where the smallest longitudinal measurement is 6 cm. On the antero-external part of the ulcer are four small circular areas of skin, which have escaped destruction. The floor of the ulcer is irregular and does not appear at any part to have been covered with healthy granulations. The edge of the skin surrounding the ulcer is in most parts abrupt and considerably raised above the level of the ulcer itself; at a few parts of the edge, especially in front, the border is more shelving and some extension of the epithelium on to the surface of the ulcer has taken place. The skin around the ulcer is thickened and, especially above the heel, presents a coarse warty surface due to enlargement of the papillæ, resulting from the chronic inflammation. 7452

From a woman, aged 62, in whom the ulcer had existed for seventeen years; the veins of the limb were varicose. Amputation was successfully performed through the upper third of the leg. (Mr. Barker's *Case-books*, 1895, vol. ii, p. 441.)

2331. A wax model of a left foot, with the lower part of the leg, in which, a little above each malleolus, is a chronic ulcer resulting from varicose veins. The skin and subcutaneous tissue of the lower part of the leg are thickened and indurated by chronic inflammation, completely concealing the outlines of the malleoli. The ulcers are crescent-shaped, and each is about 4 cm. antero-posteriorly. The edges are slightly raised, and sink abruptly to the surface of the sore; they are most raised on the concave sides of the sores, in the convexities they shelve down to the surface. There are no healthy granulations on the floor, and at no part of either sore is a blue line of new epithelium represented spreading from the edges. 4859

2332. A wax model of a left foot, with the lower half of the leg, on the outer side of which is a phagedænic ulcer 10 cm. in length by 6 cm. in breadth. The surrounding skin is healthy. The edges are slightly raised above the neighbouring skin, and are sharply cut and abrupt towards the sore. The surface of the sore is irregular and of varying depth. At the upper part a portion of the fibula is indistinctly seen through a layer of slough superficial to it. The whole surface of the sore is covered by a layer composed of sloughing tissue, pus, and extravasated blood; but this does not seem at any part to be of great thickness. 2740

2333. A wax model of an ulcer of the leg attacked by hospital gangrene. The chief ulcer is situated on the front of the leg and measures 9 cm. in length and nearly the same in width. The surrounding skin is slightly swollen and redder than natural. Several smaller superficial ulcers have formed in it; their edges are sharply cut, and their surfaces are depressed and covered by an adherent yellowish-grey slough. The edges of the large ulcer rise above the surrounding skin and sink abruptly towards the surface. Their sharply cut form and sinuous outline show that the ulcer is rapidly extending. The surface of the ulcer, raised above the level of the surrounding parts, is covered by a thick adherent blackish-grey slough. The dark colour in parts is due to blood mixed with the discharge. A small quantity of thin yellow pus is flowing from the ulcer on to the surrounding skin (see No. 2334). 2784

2334. A wax model of the same ulcer after arrest of the gangrene and separation of the slough. The ulcer has increased to about double the size represented in the preceding model. Some of the smaller ulcers have coalesced with the large one, and others have united to form another ulcer about 6 cm. in diameter on the outer side of the limb. Two small separate ulcers remain. The two large ulcers are now almost circular in outline. The edges are no longer raised; they are sharply cut, and no new growth of epithelium has yet commenced. The surface of the ulcer is covered by large, pale, and rather flabby granulations. In the middle of the sore a piece of the tibia about 5 cm. long is bare. Below and outside this a small part of the tibialis anticus is shown imperfectly covered by granulations. The ridge on the inner side is formed by the deep fascia of the limb, which has been destroyed between this point and the tibia. The outer ulcer is covered by a thick yellowish layer of discharge. 2785

2335. The outer part of the anterior half of a foot, which is the seat of neuropathic ulceration. On the dorsum of the third toe is a superficial ulcer extending from the nail to the root of the toe. Its edges are ill defined, and its surface is irregular. On the dorsum of the foot, 1 cm. from the roots of the second and third toes, is a more extensive ulcer, through which the longitudinal incision has passed. The surrounding skin is slightly elevated and the edges of the ulcer are irregular and sharply cut. The ulcer measures 3 cm. in diameter and is covered by small granulations. The section through the ulcer shows that it has completely destroyed the cutis vera. The subcutaneous tissue is infiltrated with inflammatory products to the depth of about 1 cm. The bones are perfectly healthy. Several small circular ulcers of the same type, measuring about 4 mm. in diameter, are seated higher up on the dorsum of the foot. 5450

The patient, who was under the care of Sir William Gowers, was suffering from "paralysis." There is no further history.

2336. A left hand and the lower part of the forearm, from a patient in whom amputation was performed at the shoulder-joint for rapidly spreading gangrene. The specimen has lost its characteristic appearances from the action of the spirit. The parts that were in the most advanced state of gangrene can be recognised by the separation of the cuticle and the smoothness of the skin. The smoothness is due to stretching from inflammatory exudation into the subcutaneous tissue. Three incisions have been made into the back of the hand and two into the forearm in front. A piece of skin has been cut away in front to show the swollen subcutaneous tissue.

In the recent state all the parts now seen devoid of cuticle and smooth were greatly swollen and of a dusky purple colour. When cut into they did not bleed, and the spaces of the subcutaneous tissue were tensely distended with a coagulated inflammatory exudation. There was no pus in the areolar tissue and no gas amongst the sloughs.

From a woman, a nurse, aged 34, who pricked her thumb in laying out the body of a woman who died of puerperal septicæmia on Oct. 9, 1880. The thumb at once became painful and swollen; it was poulticed and nitrate of silver applied to the wound. On Oct. 20 the hand was more swollen, the pain was worse, and there was considerable fever with frequent chills, but no rigors. On Oct. 21 the redness and swelling extended to the elbow and there was high fever. On Oct. 22 the patient was admitted into U. C. H. under the care of Mr. Heath; the swelling extended to the middle of the arm, the fingers were numb and purple, and there was discoloration of the dorsum of the hand. Incisions were made on the dorsum of the hand and in the forearm, but only blood-stained fluid escaped; glycerine of belladonna and poultices were applied. On Oct. 23 the swelling of the limb reached nearly to the axilla, the hand and fingers were swollen and of a slate-grey colour, the cuticle was separating from the forearm, leaving the exposed cutis covered with small ecchymoses for 2 inches above the wrist; there were bullæ on the hand and at the bend of the elbow; sensation was lost in the hand, but the fingers could be slightly moved by the flexors; there was no glandular enlargement. The patient was very weak and slightly jaundiced and the temperature was 103°·4. On Oct. 24 the arm was less swollen, but the gangrene extended higher in the forearm. Amputation was performed at the shoulder-joint, and the patient rapidly recovered.

The areolar tissue, as high as the middle of the arm, contained a large quantity of reddish serum, but round the brachial vessels a thin puriform fluid extended to 1 inch from the amputation-surface, and along the musculo-spiral nerve a similar fluid ran to within ½ inch of the surface of section. The muscles of the front of the forearm were soft. None of the main vessels of the limb were plugged. There was no emphysema of the limb. (*Vide* Clin. Soc. Trans. vol. xiv, p. 114.)

INFECTIVE GRANULOMATA OF THE SKIN.

The diseases included under this name are characterised by the development in the skin of a growth of granulation-tissue, which, by reason of its infective nature, progressively invades and destroys the tissue of the part. The deposit may be in the form of circumscribed nodules or diffuse infiltrations. In the skin, as in other tissues, the granulomatous deposits may undergo fibroid atrophy or may soften and caseate. In the latter case the caseous matter may calcify or, more frequently, it liquefies and a chronic abscess or ulcer is the result.

TUBERCULOUS DISEASE OF THE SKIN.

Tuberculous disease of the skin presents the same essential features as in other situations, but occurs in several forms, of which the following are the most important:—

Scrofulodermia.—In this form of the disease tuberculous nodules, often multiple, are present in the subcutaneous tissue; these soften and form chronic abscesses, from which tuberculous ulcers may result. A very similar condition may follow infection of the skin from an underlying tuberculous gland; in this way considerable areas of the superficial layers of the skin may be undermined and finally destroyed by the layer of tuberculous granulation-tissue beneath it.

Lupus Vulgaris.—In this form of the disease the tuberculous tissue is deposited in the form of minute nodules ("apple-jelly" nodules) in the cutis vera, and as the disease progresses the nodules become confluent and fresh ones become formed around the margin. In the centre of the patch the nodules may undergo fibroid change or they may soften and result in a superficial and slowly spreading ulcer.

Lupus Verrucosus.—This form of tuberculous disease of the skin is important as being a not uncommon result of direct infection by tuberculous matter, and includes the so-called "anatomical tubercle" or "post-mortem wart" (verruca necrogenica). It is characterised by the formation of an indurated tubercle or patch due to tuberculous infiltration of the deeper layers of the skin, over which the papillary layer becomes converted into a warty growth (2337).

2337. An oval piece of skin measuring 5·5 cm. by 4·5 cm., the seat of a tuberculous deposit. It is covered by a coarse papillary growth, rising uniformly about 6 mm. above the level of the surrounding skin. The papillæ vary much in size and are arranged in irregular groups separated by deep clefts. The section shows the cutis vera beneath to be considerably thickened, and densely fibrous in structure. The papillæ spring from this.

Microscopic Structure.—The specimen is one of the warty form of tuberculosis of the skin. Numerous tubercle-systems with giant cells are present and they extend up into the swollen papillæ which form the warty surface of the growth.

The patient was a young man, aged 29. The tumour was seated just above the heel, reaching from the tendo Achillis to the external malleolus. It started on the edge of an incision into a "suppurating hæmatoma," which was long in healing. It was removed in U. C. H. in 1881. In 1882 the patient was readmitted for some fresh warty growths on the dorsum of the foot in front of the external malleolus. These were ulcerating and discharging fœtid pus. They were removed. The patient had been liable to warts from infancy. (Surg. Reg. Rep. 1882, p. 60, No. 559.)

SYPHILIS OF THE SKIN.

Many of the syphilitic skin-eruptions are illustrated by a series of wax models in the museum.

Syphilitic gummata are very common in the skin and subcutaneous tissues. In the latter situation a gumma forms a firm circumscribed nodule, which gradually increases in size and becomes adherent to the skin, which assumes a dusky reddish colour. If allowed to pursue its course unchecked by treatment, the gumma softens and a thin fluid is discharged through the skin; an ulcer is thus formed, in the floor of which an adherent slough may be exposed. After the separation of the slough a considerable cavity may be left, incompletely exposed by the opening in the skin, the edges of which are at first undermined and are gradually destroyed by the extension of the ulceration (2338). Syphilitic gummata are most common in the limbs, especially in the regions of the knees and elbows.

2338. A left foot together with the lower part of the leg, showing numerous tertiary syphilitic ulcers of the skin and extensive cicatrisation and deformity. The largest ulcer involves the posterior and inner aspects of the leg and foot: it is very irregular and at the lower border the edge is undermined. Several smaller ulcers are present on the outer side of the foot. A very large area of scarring extends over the inner side of the leg and foot, and has caused much deformity of the great toe, which is strongly flexed. The ankle is fixed in a position of extreme flexion. 6751

From a woman, aged 57, who had suffered from ulceration of the left leg and foot for fourteen years. The knee-joint was flexed to a right angle. Amputation was successfully performed through the knee-joint by Stephen Smith's method. (Surg. Reg. Rep. 1891, p. 19, No. 2507.)

LEPROSY.

Although the manifestations of leprosy are by no means confined to the skin, it has been thought convenient to include all the specimens in this series.

A specific organism, the Baccillus Lepræ, which closely resembles the tubercle bacillus, is found in the skin, nerves, and other affected tissues. Leprosy occurs in three forms—the nodular, the maculo-anæsthetic, and the mixed.

In the *nodular form* the skin is chiefly affected and the lesions closely resemble those met with in the other infective granulomata. The most characteristic lesions are the leprous nodules and infiltrations. The leprous nodule may atrophy and leave a cicatrix, or soften and ulcerate (2339). The diffuse infiltration is best seen in the skin of the face (2340, 2341).

In the *maculo-anæsthetic form* of the disease the most important manifestations are skin-eruptions, affections of sensation, ulcerations, and deformities. The deformities are most marked in the hands and feet (2343 to 2357) and are largely due to atrophic changes in the bones (2350, 2355) and paralyses.

2339. Two pieces of darkly pigmented skin, each of which is the seat of a large leprous nodule. Each of the nodules is nearly circular and measures about 2·5 cm. in diameter; they are raised about 6 mm. and the smooth surface contrasts with the wrinkled skin around. Over the centre of each nodule the cuticle has separated, leaving a pale, slightly pitted surface. A section of one of the nodules shows a mixture of fibrous tissue and dense caseous material. 6292

From a negro, aged 18, born in Venezuela, who died in Trinidad of tuberculated leprosy of 9 years' duration. This and the other specimens from Trinidad were presented by Dr. Beaven Rake.

2340. A plaster cast of a face showing the changes resulting from tubercular leprosy. The face is much distorted by leprous infiltration, producing numerous tuberosities separated by deep sulci, many of which correspond with the normal lines of the part. The hair had entirely disappeared from the face. 7399

From a Chinese, aged 41, who had lived seven years in Australia before the disease was first noticed. Three small lumps first appeared on the forehead and some months later the whole face began to swell. There were numerous leprous nodules in the skin of the trunk and limbs. There was disturbance of sensation, and interference of vision was due to deposits in the iris and opacities of the cornea.

2341. A plaster cast of a face showing the changes resulting from tubercular leprosy; they are similar to, but less marked than, those in the preceding specimen. The ears are much enlarged and irregularly nodular, and along the margins they are represented as being ulcerated. 7399

From a man, aged 28, who had lived in Australia all his life.

2342. An ear from a case of nodular leprosy. The skin of the lobule and helix is thickened. 6292

From a negro native of Trinidad, aged 13, in whom the disease was of 3½ years' duration.

2343. A hand from a case of anæsthetic leprosy, showing extensive trophic changes in the fingers. The thumb is not noticeably altered, except that the soft parts at the end have retracted somewhat from the nail. In the index-finger the two last segments are wanting; in the middle finger the first and half the second segment remain, and in the ring and little fingers only part of the terminal segment is lost. The ends of the digits are more or less rounded and free from ulceration; on all, except the index, some remains of the nail can be recognised. The median nerve as it enters the palm is slightly enlarged. 6292

From Trinidad.

2344. A hand from a case of anæsthetic leprosy, all the digits showing extensive loss of substance. The thumb is much stunted and the nail atrophied; on the outer surface there is an ulcer 2 cm. in diameter. The remaining digits are reduced to mere stumps, that of the index corresponding to about the length of the first segment, and those of the other three fingers being considerably shorter. On the index and little fingers the remains of the nail is present as a small horny excrescence; on the ring and middle fingers the nail is absent, but a groove on the extremity probably indicates its original position. 6292

From Trinidad.

2345. A plaster cast of the right hand from a case of anæsthetic leprosy. The thumb is shortened as the result of great diminution in the length of the first phalanx; the joints are flexed. The remains of the fingers are strongly flexed and opposite the index-finger is a prominent ridge evidently due to contraction of the palmar fascia. 7399

From a Chinese, aged 31, who had lived in Australia for about three years. The disease began in China with a macula on the right ear and cheek. The next symptom was contraction of the fingers of the left hand, which progressed with deep ulcerations and profuse offensive discharge necessitating amputation. The condition of the left foot of the same case is shown in No. 2356. This and the other specimens of leprosy from Australia were presented by Prof. Anderson Stuart.

2346. A plaster cast of the left hand from a case of anæsthetic leprosy. The little finger is entirely absent and of the next three digits only the shrunken first segment remains; the thumb also is much atrophied and deformed. The hand is dislocated forwards and inclined strongly to the radial side. The displacement has probably occurred at the carpo-metacarpal joint (see No. 2347). 7399

2347. A plaster cast of the right hand from the same case as the preceding specimen. The four inner digits are almost completely absent and the hand terminates in a rounded nodular border. The thumb is represented by the shrunken, deformed remains of its two segments. 7399

From a Chinese, aged 34, who had lived in Australia for five years. The disease began with an affection of one of the toes of the left foot; the toe eventually dropped off. The deformity of the left foot is shown in No. 2357; the right foot was much less affected. There was partial paralysis of some of the muscles of the face and the ulnar and external popliteal nerves were enlarged and tender. At first the patient's general health suffered severely, but later was good.

2348. A plaster cast of the left forearm and hand from a case of anæsthetic leprosy. The hand shows well-marked *main en griffe* deformity, the metacarpo-phalangeal joints of the fingers being slightly over-extended and the inter-phalangeal joints strongly flexed. The last segment of the thumb with its nail is slightly atrophied; the index is similarly affected. 7399

From a boy, aged 14, who was born and had always lived in Australia. The disease began with the appearance of some "water-blisters" on the fingers of the left hand, which broke and left small ulcers; two of the nails also separated. In about two months the ulcers healed. Contraction of the fingers was then noticed and there was wasting of the forearm-muscles. There was swelling with tenderness of the left ulnar nerve. The other manifestations of the disease were maculæ on various parts of the skin and some alteration in sensation.

2349. The left hand from a case of anæsthetic leprosy. The pigmented cuticle has largely separated as the result of maceration. The thumb is adducted and its second joint over-extended. The four inner digits are flexed to a right angle at the first inter-phalangeal joint, the last joint of the middle and ring fingers being slightly over-extended. The muscles of the thenar eminence are evidently much atrophied. The nails, especially of the thumb and ring fingers, are unduly curved both transversely and longitudinally. 6292

From Trinidad.

2350. A left hand showing almost complete loss of the thumb and considerable loss of the extremities of the other digits, the result of anæsthetic leprosy. A section of the index shows that the terminal phalanx and the second phalanx with the exception of its base have been destroyed. On the extremity of each of the stumps of the three inner digits is an ulcer, that on the little finger exposing a fragment of the base of the second phalanx and the joint between it and the first. 6292

From Trinidad.

2351. A left hand from a case of anæsthetic leprosy, showing general atrophy and extensive affection of the digits. The thumb is atrophied and strongly flexed at the metacarpo-phalangeal joint. Only the proximal parts of the four inner digits remain, the stump of the ring-finger, which is the longest, representing the first segment. There is no ulceration and except in the thumb no remains of the nails can be recognised. 6292

From Trinidad.

2352. A left hand in which the digits have been completely destroyed up to the level of the metacarpo-phalangeal joints, as the result of anæsthetic leprosy. There is no evidence of ulceration ; the nail of the thumb can be still recognised as a small horny prominence on the palmar surface of the stump. The median nerve and its branches, which have been dissected in the palm, do not appear to be thickened. 6292

From Trinidad.

2353. A left foot, much atrophied and deformed as the result of anæsthetic leprosy. Extensive loss of substance has evidently taken place in the tarsus and metatarsus and by the yielding and displacement of those bones which remain the arch of the foot is entirely obliterated and the prominence of the heel is greatly exaggerated. The three outer toes are wanting and the remaining two are atrophied and deformed (see No. 2354). 6292

2354. The right foot from the same case as the preceding specimen, atrophied and deformed as the result of anæsthetic leprosy. The foot is in the position of talipes equino-varus. The four inner toes are much atrophied and the fifth is wanting. 6292

From a native of Trinidad, aged 48, in whom the disease was of 34 years' duration.

2355. The anterior extremity of a left foot, showing extreme atrophy resulting from anæsthetic leprosy. The section of the foot has passed through the cuboid and cuneiforms, and the part of the foot anterior to the section has been reduced to a length of 2 cm. by the atrophy of the metacarpals and phalanges. The atrophied remains of four toes are present. 6292

From Trinidad.

2356. A plaster cast of a left foot showing extreme deformity resulting from anæsthetic leprosy. The foot is in a position of eversion and dorsal flexion. The heel is prominent and the tendo Achillis forms a curved ridge. Separated from the inner side of the heel by a hollow is another marked prominence probably caused by the head of the astragalus. The dorsal flexion is so extreme that the front of the foot is directed almost vertically upwards. The four outer toes are not much altered, but the great toe is atrophied and displaced. 7399

From the same case as No. 2345.

2357. A plaster cast of a left foot showing deformity resulting from anæsthetic leprosy. There is considerable swelling in the region of the ankle and the foot is extended and everted. The drawing up of the heel is so marked that deep transverse grooves have been produced in the skin above it. Of the four outer toes only three remain in the form of rounded nodules; the great toe also is considerably atrophied. 7399

From the same case as Nos. 2346, 2347.

Actinomycosis of the Skin.

Primary actinomycosis of the skin is very rare, but the skin is frequently involved secondarily from a primary focus of the disease in a deeper part. In this case the affected skin presents usually numerous softened areas, which after discharging leave intractable sinuses. The changes thus closely resemble those present in some forms of tuberculous and syphilitic disease of the skin. The recognition of the disease is dependent upon the detection in the discharges of the characteristic yellow grains and their subsequent microscopic examination.

Madura Foot.

This mycetoma, although commonly described under the name of Fungus foot or Madura foot, is occasionally met with in the hand. It is characterised by great enlargement and distortion of the affected part, chiefly affecting the skin and subcutaneous fat, with degeneration and destruction of the bones. A section through the affected foot shows a number of sharply defined cavities lined by a membrane (2358). These cavities may be single or may communicate with others. Many open upon the surface by sinuses (2358) discharging a semi-purulent, oily fluid, in which minute grey or black grains are found. The contents of the cavities vary in different cases. In the so-called "white form" of the disease the cavities are filled by masses of small spherical bodies like fish-roe surrounded by a glairy substance, or by the gelatinous substance alone, occasionally having small red dots scattered through it. In the "black form" the cavities contain dark brown or black masses of various sizes, from a mere speck to the size of an orange. They are tuberculated on the surface and present a radiating structure. With these may be a certain amount of glairy matter. The muscles may be recognisable or may have undergone fatty degeneration so as to be no longer recognisable. The bones are atrophied, fatty, and soft, so that they can be easily cut by a knife (2359).

Examination of the minute grains found in the discharges and tissues in the white variety of the disease has shown them to consist of numbers of colonies of a ray-fungus closely resembling that found in actinomycosis and regarded by most observers as the cause of the disease. A fungus has also been demonstrated in the black form of Madura foot, but some doubt exists as to its identity with that associated with the white variety.

2358. The outer part of a left foot affected with fungus disease. The foot is considerably increased in size and altered in form. On the skin of the dorsum and outer side are numerous flat elevations, slightly raised above the level of the surrounding skin. They measure from 2 cm. to 3 cm. in diameter. Some are ulcerated in the centre, and all have small sinuses opening through them. Small sinuses with raised margins also open in the sole. The section shows that the tissues of the foot are throughout the seat of cavities which vary in size and give to the whole a coarse spongy appearance. The smaller bones of the tarsus appear to have been extensively destroyed by the disease, which has also extensively involved the anterior part of the os calcis. The cavities are lined by a smooth membrane and most of them are empty, but a few contain a soft spongy grey matter. In the diseased part of the os calcis the membrane surrounding the cysts appears to be separable from the bone. The tibia and astragalus are atrophied, but not otherwise diseased. 5386

Iracloo, aged 20, was admitted on May 28, 1870, into the hospital at Gunton. He said that two years before he noticed a small blister on the side of the left foot; shortly after the ankle began to swell, and sores broke out in different parts of the foot. For one year past he had been unable to walk, and the pain was very severe at night. The foot was greatly swollen, tense, and shining, and there were numerous sinuses, that discharged a watery and glairy fluid, and at times blood. The leg was amputated a few inches below the knee in June, and the patient was discharged a month later.

2359. Half the left foot of a Hindoo, affected with fungus disease. The foot is greatly enlarged and altered in form, the vertical measurement being considerably increased. The cuticle has desquamated over the greater part of the foot, leaving it free from pigment. On the dorsum the skin presents a peculiar sponge-like appearance, and is apparently ulcerating superficially. On the inner side and sole of the foot are several sinuses, the openings of which are surrounded by a raised border of skin. The soft parts are greatly thickened, and for the most part present a uniformly fibrous structure. In the sole of the foot a thin layer of unaltered fat remains beneath the skin; but the muscles and tendons are for the most part lost in the new growth. The centre of the foot is occupied by a number of large irregular cavities with more or less smooth walls communicating one with another. No trace of the middle cuneiform, beyond a small fragment of its articular surface for the navicular, can be recognised, and the space where the metatarsal bones should lie is occupied by the cavities before mentioned. The cavities open on the surface by the sinuses before described; their contents have not been preserved. A few black dots are scattered here and there through the walls of the cavities, but they do not form a marked feature. The disease has extended into the cancellous tissue of the os calcis and navicular; the anterior part of the astragalus is atrophied; the lower end of the tibia is normal. 5385

Abdool Naily, aged 22, a labourer, was admitted into the Civil Dispensary, Gunton, India, on May 23, 1870. Two years previously he had a small pimple on the sole of the left foot near the outer toes, which soon formed an open sore. Sores then broke out in other parts of the foot, which began to swell, and blackish matter discharged from the sores. He had been unable to walk for a year, but until that time had not suffered much pain. The foot was much swollen, particularly at the metatarsus, and there were many sinuses in and about the swollen parts. The parts about the ankle looked healthy. On May 24 the leg was amputated a few inches below the knee. The bones of the leg were unusually soft, and yielded readily to the saw. The astragalus and the tibia both contained some blackish fluid in the enlarged cancellous spaces. This and the preceding specimen were presented by Dr. Tilbury Fox.

2360, 2361. A Madura foot divided into two parts by a longitudinal incision. The foot is greatly enlarged, and forms an irregularly oval mass, from the anterior extremity of which the toes project. The vertical diameter of the foot at the roots of the toes is about 8 cm., at the metatarsus it is 11 cm. The skin is darkly pigmented, but scattered all over it, from the toes to the ankle, are rounded, colourless or pale pink elevations varying in size up to 3 cm. in diameter; some of these are ulcerated in the centre and others present a central opening, apparently leading to a sinus extending into the deep parts; but the majority are covered by a thin cutaneous layer. The cut surface shows that the greater part of the mass is formed of chronic inflammatory products, for the most part structureless to the naked eye, but in parts fibrous. In the sole of the foot some normal fat remains, and some fatty degenerated muscle and a tendon may be recognised. The bones are extensively destroyed, but fragments of all can be recognised, and in the osseous tissue as well as in the soft parts large numbers of small cavities, lined by a smooth membrane, are present. The contents of these cavities have fallen out. There are no black masses either in the cavities or in the diseased tissues.

2362, 2363. A Madura foot divided into two parts by a longitudinal incision. The foot is moderately enlarged, especially vertically, in which direction it measures 9 cm. opposite the tarso-metatarsal joint. On the dorsum and borders of the foot are numerous elevations, caused by the protrusion of a cheesy-looking substance through the skin. In the sole a large number of similar foci have become confluent so as to produce a large slightly raised ulcerated surface, at the borders of which, especially in front, the separate rounded deposits can be seen. On the surface of the section the remains of the tendinous and fascial structures can be recognised, mixed with spongy fibrous tissue in which small irregular cavities are present. Where the section passes through the ulcerated area in the sole, a thick layer of cheesy-looking substance lies superficial to the plantar fascia. The front part of the os calcis is extensively diseased and presents numerous small intercommunicating cavities. 7208

From a native of Barbadoes.

SIMPLE TUMOURS OF THE SKIN AND SUBCUTANEOUS TISSUES.

Fibroma of the Skin and Subcutaneous Tissues.

The following are the chief varieties of fibroma of the skin and subcutaneous tissues :—

(1) *The isolated hard fibroma* is rare, and seldom reaches a large size. It may arise in the deeper layers of the cutis or in the subcutaneous tissue. Occasionally similar tumours are met with in the fasciæ and deeper planes of connective tissue, but in these situations the growth is more often a fibro-sarcoma. A hard fibroma of the skin forms usually a rounded tumour over which the papillary layer of the skin is smoothly stretched ; its deep aspect is sharply circumscribed (2364). No. 2367 is a specimen of a very large fibroma of the subcutaneous tissue, in which mucous softening has occurred.

(2) *Keloid.* This is a dense fibrous growth originating in the corium ; it forms a smooth, well-defined, and slightly raised elevation, white or pinkish white in colour, often claw-like at the margin, and irregular in outline (2371). Keloid usually develops in a cicatrix, but a similar growth sometimes arises apparently spontaneously, especially on the front of the chest. Probably the latter form also arises in a small unrecognised scar. No. 2372 is an example of keloid originating in the scars caused by acne. The large fibrous tumours met with in the ears of negroes are probably allied to keloid and originate in the punctures made for ear-rings (2374).

(3) *Multiple subcutaneous fibromata.* These tumours, which are usually of small size, lie immediately beneath the skin and may be present in large numbers (2378–2380). It is probable that they originate in connection with the nerves.

(4) *Molluscum fibrosum.* In this disease soft fibrous growths occur in the skin ; they may occur as sessile or slightly pedunculated rounded tumours, or, if a considerable area of the skin is involved, large hanging folds are produced. In some cases a single large pedunculated tumour is produced (2375). Molluscum fibrosum is occasionally associated with the fibrous tumours of the subcutaneous tissue which are believed to be fibromata of the nerves, and it is thought by some pathologists that it also has a similar mode of origin. Irregular pigmentation of the skin is sometimes also present and a tendency to the development of sarcoma has been noted.

2364. A fibrous tumour involving the skin. The tumour has been divided through the middle, and the section measures about 3 cm. in thickness and 5 cm. in length. It forms a conical projection of about 2 cm. above the level of the surrounding skin ; the skin over the peripheral part of this is stretched and smooth ; at the apex it has been destroyed by ulceration. At the margin of the ulcer on one side the papillæ of the skin are considerably enlarged. The section shows that the tumour extends to the fascia covering a muscle (probably the deltoid), a piece of which has been removed with it ; its outline in this direction is sharply defined. Towards the subcutaneous fat its limits are less clearly marked, and it seems fused with the cutis in such a manner as to suggest that it originated in it. The tumour is firm and hard, and has cut smoothly. It is marked by numerous intersecting bands of dense glistening fibrous tissue.

Microscopic Structure.—The tumour is a fibroma. Between the fibres great numbers of oat-shaped nuclei are to be seen, but the outline of the cells to which they belong cannot be defined.

2365. A fibroma removed from the subcutaneous tissue of the back. It is irregularly oval in form, and measures 4·5 cm. by 2 cm. Its surface is smooth, and it has evidently been free from adhesions to the surrounding parts. The section shows it to be composed of fibrous tissue forming bands running in various directions ; at one end is a rounded nodule about 1 cm. in diameter, in which these are arranged concentrically. One or two large vessels are seen standing widely open on the surface of the section. 979

Microscopic Structure.—The tumour consists of very dense fibrous tissue.

2366. Half an irregularly oval tumour, measuring about 8 cm. in its longest diameter. It is coarsely lobulated on the surface. It has been cleanly removed from the surrounding parts, and has evidently been enclosed in a loose areolar capsule. Its cut surface shows bundles of glistening fibrous tissue like those of a tendon. Superficially these are arranged parallel to the surface ; more deeply they cross in all directions, and some are arranged concentrically in small areas.

Microscopic Structure.—The tumour is composed of dense fibrous tissue containing numerous small elongated cells.

2367. A large cystic fibroma of the subcutaneous tissue, together with the skin covering it. The tumour, which is nearly globular, measures 15 cm. in diameter, and has been opened on its deep aspect. The central part of the tumour has so extensively softened as to leave only a solid cyst-wall having a maximum thickness, in the part that has been divided, of less than 2 cm. The interior of the cyst is irregular, especially in its superficial part, where masses of friable fibrous growth, in parts cystic, project into the interior. The deep surface of the tumour is slightly lobulated and has a fibrous capsule over which some large veins ramify ; it appears to have been readily separated from the surrounding tissues. The skin covering the tumour is not implicated by the growth, but is loosely connected with its surface by fibro-fatty tissue ; it presents in one place an oval superficial ulcer, 3 cm. in diameter, around which the skin is irregularly pigmented. 9688

Microscopic Structure.—The dense tissue which forms the wall of the cyst consists of fibrous tissue containing many spindle-shaped nuclei.

From a man, aged 23, who noticed a small hard lump on the inner side of the right thigh a few weeks after a blow on the part. The tumour slowly increased in size and the skin over it ulcerated. When the patient came under the care of Dr. Ord Mackenzie in March. 1904, the tumour measured 15 × 13½ inches across. During the removal of the tumour there was considerable venous hæmorrhage and the tumour was found to be connected with the femoral sheath. Its weight after removal was 4¾ lbs. and it contained 3 pints of clear serous fluid.

2368. Half a rounded tumour, with the skin covering it. The cut surface measures 8·5 cm. by 5·5 cm. The tumour has evidently formed a considerable prominence on the surface, and for more than half its circumference is in close contact with the skin without the intervention of any subcutaneous fat. The skin is thinned and stretched, but apparently not implicated by the tumour. The tumour is enclosed in a distinct capsule of fibrous tissue, and is composed of three chief parts, held together by loose areolar tissue. Its cut surface is remarkably smooth, showing that its structure is dense and hard; it shows in parts wavy lines of fibrous tissue.

Microscopic Structure.—The tumour is a pure fibroma; it is composed of dense white fibrous tissue with a few flattened cells among the fibres.

2369. A small rounded tumour with the skin covering it. It measures about 13 mm. in its longest diameter. It is loosely encapsuled in areolar tissue, and not adherent to the skin. Its surface is smooth. It has been laid open by an incision. The section is smooth, and presents no definite structure to the naked eye. 5767

Microscopic Structure.—The tumour is a pure fibroma.

It was removed from the pinna of the ear.

2370. A small piece of skin, in which a small fibrous growth (keloid) has developed in a scar, in section. The tumour measures 1·5 cm. in length; it projects prominently from the surface of the skin and has a rounded border and a smooth, slightly lobulated surface covered with epithelium. The section shows that the tumour is intimately connected with the corium and has a dense texture. 7216

Microscopic Structure.—The growth is composed of fibrous tissue. In parts there are bundles of fibres containing spindle-shaped cells; in other parts the tissue is more loose and the cells rounded. Superficially the growth extends into the corium.

2371. A wax model of keloid in the skin over the sternum. The largest of the three growths measures 3 cm. in length and about 1 cm. in width; it is pinkish in colour, raised, smooth on the surface and marked by fine dilated blood-vessels. The edge of the growth passes into the surrounding skin in the form of fine radiating ridges. The two smaller growths present similar appearances. 5190

2372. An elliptical strip of the skin of the nape of the neck, removed for acne keloid. The growth measures 5 cm. in length and 17 mm. in breadth. The surface of the growth is smooth and convex, and marked by numerous small depressions, from some of which a hair projects. The section shows that the dense growth, which is intimately connected with the corium, extends deeply below the surface of the skin and is marked by vertical lines of fibrous tissue (see No. 2373). 6564 A

Microscopic Structure.—The growth consists of dense bundles of fibrous tissue, in which are small masses of small round cells. A sebaceous gland and hair-follicle, seen in the section, appeared to be normal.

2373. Part of a strip of skin including a recurrent growth of keloid; from the same case as the preceding specimen. The characters of the growth are very similar, and on the divided surface the dense fibrous tissue composing the growth has a thickness of 1 cm. Along one edge of the specimen the skin is thickly covered with hairs, and along the adjacent edge of the keloid growth the hairs are arranged in tufts which project from small depressions on the surface of the growth. 8199

From a man, aged 40, who was admitted into U. C. H. in 1890, under the care of Mr. Berkeley Hill. The growth had gradually formed after an eruption of boils on the neck three years previously. Soon after its commencement it was removed by the cautery, but recurred and for seven months had been steadily increasing in size. The growth was situated on the right side of the back of the neck; its surface was reddened and there were numerous minute collections of pus beneath the cuticle covering it. The growth was excised (Surg. Reg. Rep. 1890, p. 127). The wound did not heal and the growth gradually recurred. The patient was re-admitted to the hospital in 1899, when the growth presented similar appearances to those above described, but was more extensive. It was again excised, the tissues divided being very dense and vascular (Surg. Reg. Rep. 1899, p. 167).

2374. Three fibrous tumours removed from the ears of negroes. The largest measures 10 cm. in its longest diameter, the smallest nearly 5 cm. They are irregularly lobulated and wrinkled on the surface, and darkly pigmented. The section shows that they are composed of dense fibrous tissue arranged chiefly in bundles intersecting in all directions. The tissue is an outgrowth of the cutis vera and takes its place. It is covered by an epithelial layer darkly pigmented, as in the normal skin of the negro.

These tumours were sent to Dr. Tilbury Fox by Dr. Izett K. Anderson of Jamaica, and were exhibited at the Pathological Society of London. They were described as keloid growths from the ear. They are not uncommon amongst the West-Indian negroes, and arise in the punctures made for ear-rings. Microscopic examination showed them to be composed of "condensed fibrous tissue." (Trans. Path. Soc. vol. xxii, p. 313.)

2375. A large soft fibroma, measuring 13 cm. vertically and covered by skin. It was attached to the iliac region by a narrow pedicle about 3·5 cm. in its longest diameter. The tumour consists of two portions, one larger and round in form, and the other smaller and cylindrical, the whole presenting some resemblance in form to the male genital organs. The skin covering the tumour is coarsely wrinkled and deeply pitted; at the lower part of the specimen it is sloughing. An incision has been made into the larger portion of the tumour; it is composed of bands of white fibrous tissue crossing in all directions. Towards the surface the structure becomes more dense and is continuous with the cutis vera. There is some fat in the pedicle. There is no line of demarcation between the tumour and the normal tissues in the pedicle. In the deeper parts of the tumour a few large vessels are seen in section.

Microscopic Structure.—The tumour is composed chiefly of bundles of white fibrous tissue, which in many parts present an almost hyaline appearance, as if swollen by œdema. The bundles are separated by a tissue rich in round cells.

The tumour is an outgrowth from the cutis vera. It was removed from the iliac region of a woman by Sir J. Erichsen in 1865. It had grown very slowly and, until the skin covering it sloughed, had given no inconvenience. It became pedunculated as it increased in size, and the pedicle was gradually increasing in length from the weight of the mass. (It is figured in Erichsen's 'Science and Art of Surgery.')

2376. A small soft fibroma of the skin, measuring 3 cm. in its longest diameter. Its surface, which is covered with skin, is deeply cleft and wrinkled. The divided pedicle, situated at the point at which the specimen is suspended, measures 4 mm. in diameter. 9158

From a woman, aged 40. The tumour had been noticed for three years and was attached to the skin above Poupart's ligament on the left side.

2377. Two plaster casts of molluscum fibrosum, the larger being of the skin of the back and the smaller of the skin covering the deltoid. The skin is the seat of many prominent rounded tumours, varying in size from 2 mm. to 3 cm. in diameter. 9095

The casts were taken from a patient under the care of Mr. Marshall in 1879.

2378. The left ear from a case of multiple fibromata. At the upper part of the ear is a large fibrous tumour presenting a curve in conformity with the helix, from which it has arisen; the tumour is lobulated and 4 cm. in breadth; it extends from the helix on to the posterior surface of the pinna; the skin covering it is thin, wrinkled, and discoloured. Below the tumour above described an unaltered portion of the helix, 1·5 cm. in length, is seen, and below this again is another tumour, which is nearly globular and measures 3·5 cm. in diameter; from the lower border of this tumour the helix extends to the lobule, which is normal. A separate small growth is connected with the posterior border of the concha (see No. 2379). 9769

2379. A fibrous tumour of the scalp, from the same case as the preceding specimen. The tumour is nearly circular in outline, measuring 8 cm. in diameter and having a thickness of rather more than 2 cm. The edges of the tumour are rounded and the surface is covered with slightly wrinkled skin, over the central part of which the growth of hair is very deficient. On its deep surface the tumour is slightly lobulated (see No. 2380). 9770

2380. A finger from the same case as the two preceding specimens. The skin of the finger is coarse and much wrinkled and thickened. Two more definite fibrous growths are present, one on the palmar aspect of the last segment and one on the dorsal surface of the middle segment. 9771

Microscopic Structure.—The tumours consist of a dense fibrous material in some parts composed of cellular, well-developed, fibrous tissue, and in others having a hyaline ground-substance; they are very vascular. In some of the tumours the growth is only lightly attached to the skin and deeper tissues, in others the growth is more diffuse. No nerve-fibres can be found in the tumours.

From a man, aged about 34, in whom the first symptom observed was enlargement of the gums when he was about 3 months old, the affection of the skin being noticed six months later. At the time of his death there were scattered subcutaneous tumours on the trunk, none of which were of large size, except those in the gluteal region. The tumours were largest and most numerous on the scalp, ears, nose, fingers, and toes. Two sisters, one older and one younger than the patient, were the subjects of a similar affection of the gums and skin. (John Murray, Med.-Chir. Trans. vol. lvi, 1873, p. 235, and Whitfield and Robinson, Med.-Chir. Trans. vol. lxxxvi, 1903, p. 293.)

LIPOMA OF THE SUBCUTANEOUS TISSUES.

Lipoma, or fatty tumour, is the most common new growth met with in the subcutaneous tissue. A typical lipoma is composed of adipose tissue differing in no respect from normal fat; it is enclosed in a loose capsule of areolar tissue. In form the tumour is most frequently lobulated, often excessively so; its surface is smooth (2381, 2382). If allowed to grow, a fatty tumour may attain a great size, the skin covering it may then become adherent to it, and ultimately inflammation and ulceration may occur as the result of the stretching of the integuments by the growth and the friction of the clothes. In large fatty tumours which have been exposed to pressure, the tissue is often indurated by the development of an excess of fibrous tissue.

Occasionally areas of calcification are met with, usually in the form of a thin calcareous lamina looking like an egg-shell imbedded in the tumour (2384, 2385). This surrounds a mass of altered fat in which the structure of adipose tissue is lost; the fat is amorphous, and is said in some cases to be saponified and forming a lime-soap.

Fatty tumours are most common about the back and shoulders (2382). They are usually single, but may be multiple.

Mixed tumours containing adipose tissue are occasionally met with, such as *fibro-lipoma*, *myxo-lipoma*, and *nævo-lipoma*; but these are not common.

The name *diffuse lipoma* is applied to certain localised formations of adipose tissue, which differ essentially from the ordinary lipoma in the absence of an investing capsule. These tumours are most common in the neck.

Fatty tumours are occasionally deeply seated, as, for instance, in the intermuscular planes of connective tissue, and in such situations as the retro-peritoneal tissue, the spermatic cord, and beneath the palmar fascia.

2381. A small lobulated fatty tumour of the subcutaneous tissue. 6647

2382. A large fatty tumour, measuring about 19 cm. in its longest diameter. It is composed of one large mass and a number of smaller lobes; these are constricted at their attachment to the main part of the tumour. The surface is everywhere smooth, and has evidently been separated from the surrounding parts by a very loose capsule of areolar tissue, from which the tumour has been turned out without difficulty. The tumour presents the ordinary appearances of adipose tissue. 4724

The patient was a middle-aged woman, and the tumour was situated on the top of the shoulder in front of the acromion. It was first noticed sixteen years before removal, when it was not much larger than a pea. It did not grow much for three or four years, and even after ten years did not exceed the size of a duck's egg. For the last six years before removal it rapidly increased until it attained the dimensions shown in the specimen. It was removed in U. C. H. by Mr. Marshall. The tumour was slightly movable and caused no inconvenience except an itching sensation at times. No other growth of the same kind existed in any other part of the body, and there was no history of similar tumours in the family.

2383. A fatty tumour measuring about 8 cm. in diameter. It is irregularly globular in form, somewhat flattened on the sides, and slightly lobulated. It is yellowish in colour, and its surface is less smooth than is usual in fatty tumours. The loose areolar tissue surrounding it seems to have been in part removed with it. 3862

2384. A section of a large fatty tumour, measuring 13 cm. by 6 cm. The tumour is enclosed in a loose capsule of areolar tissue, which has been removed with the tumour, and at one part has been separated from its surface, which is smooth and very slightly lobulated. The section of the tumour shows its structure to be denser, whiter, and more opaque than normal adipose tissue. At the upper extremity of the specimen an oblique slice has been taken off to show an oval area, measuring about 7 cm. by 3·5 cm., in which the structure of the tumour differs from that of other parts; it is yellow, and appears perfectly homogeneous to the naked eye. This area is surrounded by a delicate calcified wall resembling an egg-shell. 6126

The tumour was removed by Mr. Heath from the back of a lady. The lobulated part was the deepest. The formation of an egg-shell-like zone of calcification enclosing altered fatty matter, sometimes saponified with lime or soda, is not uncommon in old indurated lipomata.

2385. A section of a fatty tumour. The tumour measures 11 cm. by 8 cm. and presents the usual lobulated surface. On the surface of the section an elongated area, including nearly the whole length of the tumour, can be readily distinguished from the rest of the growth; it is rather softer and of a deeper yellow colour. It is surrounded by a very thin calcified layer. 6786

From a woman, aged 73. The tumour was situated at the lower part of the back.

2386. Half a large lipoma, with the skin covering it. The cut surface of the tumour is oval in form, and measures 14 cm. by 9 cm. At one end of the mass is a large irregular cavity measuring 6 cm. in diameter. On one side the wall of the cavity is formed by the thickened capsule of the tumour; elsewhere the wall of the cavity is formed by the tumour itself. The cavity is lined by a thin layer of granulation-tissue. The rest of the tumour presents the ordinary appearances of a fatty tumour. The skin covering the tumour is not adherent to it, except opposite the abscess-cavity, where a small depressed opening communicates with it. The skin above this opening is thickened and apparently cicatricial, and close to the upper divided edge of the specimen presents three other ulcerated openings leading into the abscess.

The cause of the suppuration in the lipoma is uncertain.

2387. A large ovoidal fatty tumour, measuring 18·5 cm. in its vertical diameter. Except in its upper part the tumour is covered with skin, and above the divided edge of the latter the exposed surface of the tumour is coarsely lobulated. 6879 A

The tumour was removed from the axilla by Mr. Heath.

2388. A very lobulated fatty tumour removed by operation from the perineum. The tumour measures 15 cm. in its greatest length. Each extremity of the tumour is composed of a single large lobe, one globular and the other elongated; these are united with an intermediate mass of smaller irregular lobules. A section which has been made into the largest lobe displays a yellowish-brown area of calcification. 7944

From a man, aged 39, who was under the care of Mr. Bilton Pollard in U. C. H. in 1898. The tumour had been growing for three years; it formed a swelling as large as a fœtal head, which occupied the right half of the perineum, extending from the anus to the root of the scrotum. The characters of the tumour were those of an ordinary lipoma, but there was in it such a well-marked impulse on coughing as to suggest the possibility that the tumour formed part of a perineal hernia. The tumour was removed through an incision 8 inches in length and was found to extend high up in the ischio-rectal fossa into close apposition to the levator ani muscle, from which it was readily separated. This relation of the tumour explained the impulse on coughing. (Surg. Rep. Rep. 1898, p. 210, No. 735, and H. J. Curtis, Trans. Path. Soc. vol. xlix, 1898, p. 309.)

MYXOMA OF THE SUBCUTANEOUS TISSUE.

Tumours composed of pure myxomatous tissue are extremely rare, and it is probable that some of the tumours of this nature met with in the subcutaneous or deeper layers of the connective tissue have originated in connection with the sheaths of nerves. A myxoma forms a lobulated gelatinous tumour, from which in the recent state a viscid fluid can be squeezed.

2389. Part of a myxoma removed from the subcutaneous tissue. It measures 4 cm. in its longest diameter and is invested by a fibrous capsule. The section shows areas of semitranslucent substance separated by delicate fibrous septa. 6965

In the fresh state the tumour was very soft and jelly-like, and ropy mucous fluid could be squeezed from it.

Microscopic Structure.—The tumour consists of a fine reticulum, the fibrils of which can in part be traced into connection with branching cells. In the fresh state the meshes of the reticulum would be filled with a mucous fluid.

TERATOMA OF THE SKIN.

2390. A small nodular tumour, with part of the skin of the scalp covering it. The skin is normal and not adherent to the tumour. The surface is irregularly nodular. The tumour is so hard that it was with difficulty divided with a knife. The cut surface presents the characteristic bluish semitranslucent appearance of hyaline cartilage; mixed with the cartilage are irregular yellow areas of bone. 7648

Microscopic Structure.—"The cartilage which forms the main mass of the tumour varies in character in different portions of the section; at one part it is hyaline, and at another the cells are angular and branched, and the stroma is delicate and fibrillated." In some parts the normal process of ossification in cartilage is seen. At one part of the section are groups of cells resembling epithelium and spaces lined by columnar epithelium one or several layers in thickness; similar cells are also present in fibrous tissue containing lobules of fat. In some spaces lined by several layers of cells the innermost resemble those of the cuticle and stain deeply with eosin.

The tumour was removed from the scalp of a man, aged about 36, who had been aware of its existence for seven years; it was situated over the upper and posterior part of the right parietal bone and was superficial to the epicranial aponeurosis. (Douglas Drew, Trans. Path. Soc. vol. xlviii, 1897, p. 222.)

ANGIOMA OR VASCULAR NÆVUS OF THE SKIN AND SUBCUTANEOUS TISSUES.

Angiomata are tumours formed of blood-vessels of new growth; they are usually congenital, but often grow rapidly after birth. Angiomata are very common in the skin and subcutaneous tissues, but they also occur in other situations, such as the deep fasciæ (2393), muscles (1105), mucous membranes (1775), liver, and brain. According to the type of blood-vessel of which the tumour is composed angiomata are divided into capillary angioma, cavernous angioma, and arterial angioma.

1. *The simple angioma or capillary nævus* is very common in the cutis, but some of the subcutaneous nævi are of the same structure. The tumour is composed of dilated capillaries and small veins surrounded by structures normal to the parts in which it

is situated (2392). When situated in the cutis the growth usually extends into the fat immediately beneath it and the vessels are most abundant around the sweat-glands and hair-follicles. The capillary cutaneous nævus may present merely the appearance of a dark red stain in the skin often involving a large area, but in other cases it may form a circumscribed and slightly raised tumour often with a warty surface.

2. *The cavernous angioma* resembles in structure that of normal erectile tissue and is composed of wide vascular spaces bounded by fibrous septa lined with a flattened endothelium. The tumour can often be diminished in size by pressure, slowly filling again when the pressure is removed; it becomes tense during a violent expiratory effort. The spongy structure of the tumour can readily be seen in a section through it (2393). A cavernous angioma is usually surrounded by a distinct fibrous capsule, and the arteries and veins which pass through this are neither large nor numerous, so that the removal of the tumour, if the capsule be not injured, is not attended with unusual hæmorrhage.

3. *The arterial or plexiform angioma* is rare. It is usually met with in the scalp, in the area of distribution of the temporal artery (2396). Plexiform angiomata sometimes form considerable tumours in the subcutaneous tissue, composed of convoluted masses of forcibly pulsating, dilated arteries.

Nævo-lipoma is a tumour in which the angiomatous growth is associated with a considerable formation of fat. Occasionally the new growth is diffuse and affects a considerable part or even the whole of a limb, causing an appearance of hypertrophy of the part (2397).

2391. An elliptical piece of skin, measuring 2·5 cm. by 1 cm., with a capillary nævus. The tumour forms a rounded prominence on the surface; the skin covering it is a little darker than that at the ends of the specimen.

Microscopic Structure.—The tumour is made up of connective tissue similar to that forming the normal cutis vera, in which are innumerable tortuous vessels. These have a fibrous wall and are lined by an abundant endothelial layer; they are mostly round like normal vessels, and in many parts form convoluted masses. These are most abundant around the hair-follicles and sebaceous glands. Tbeir diameter reaches about $\frac{1}{100}$ inch. In some parts where the new vessels are penetrating into the fat they are surrounded by numerous small, rounded cells, like those of granulation-tissue.

2392. An elliptical piece of skin, the central part of which is the seat of a nævus, which also forms a flattened circumscribed lobulated tumour in the subcutaneous tissue. The cutaneous part of the growth can only be recognised in the present condition of the specimen as an oval area in which the skin is slightly discoloured and more irregularly wrinkled than elsewhere. On the surface of the upper extremity of the subcutaneous part of the tumour one of the supplying arteries can be seen. The section of the tumour presents the appearance of adipose tissue. 9057

Microscopic Structure.—The tumour is a capillary nævus. It is divided into lobules by thick fibrous septa. The closly packed tortuous capillaries have very cellular walls and prominent endothelial cells. Among the vessels are numerous fat-cells.

From the chest-wall of a child, external to the left breast. The nævus had previously been treated by puncture with a cautery.

2393. A cavernous nævus removed by operation from the temporal fossa, in section. It forms a flattened rounded tumour, 4 cm. in diameter, surrounded by a fibrous capsule, and its surface is lobulated. The dark red colour of the growth in its fresh state has largely been lost by immersion in spirit. On the surface of the section the tumour presents a finely spongy structure closely resembling that of the erectile tissue of the penis. 6564

Microscopic Structure.—The tumour consists of a fibrous meshwork, the spaces of which are filled with blood.

From a man, aged 45, who was under the care of Mr. Heath in U. C. H. in 1890. Fifteen years previously the patient noticed a lump in the left temple as large as the tip of his little finger; the tumour gradually increased in size and was the seat of slight dull aching pain.

The tumour was thought to be superficial to the temporal muscle and was regarded as a sarcoma; at the operation, however, it was found that the tumour lay beneath the muscle; after dividing the latter the tumour was very easily enucleated with the finger. (Surg. Reg. Rep. 1890, p. 41, No. 917.)

2394. A wax model of a large nævus in the perineum of a male infant. The tumour projects prominently from the surface. Its base is oval, measuring 7 cm. by 5·5 cm. It reaches from immediately behind the scrotum to a point over the tuberosity of the ischium; externally it sinks gently down into the upper and inner part of the thigh, internally abruptly down to the side of the anus. Its surface is slightly lobulated. It is of a pale purplish tint mottled with dark blue spots. 2555

2395. A small oval tumour removed from the dorsal surface of the thumb, in section. It measures 17 mm. in length; the surface has a convoluted appearance, due to the presence of the tortuous vessels of which the tumour is composed. The cut surface displays the divided vessels filled with blood; the largest measure 2 mm. in diameter. 8338

Microscopic Structure.—The tumour is a cavernous angioma.

Before removal the tumour was thought to be a ganglion. There was a history of injury.

2396. A wax model of the left side of the head of a patient, in whom the common carotid artery was tied for the cure of an arterial angioma of the scalp. The enlarged vessels form a knotty branching prominence over the lateral frontal, and mid-parietal regions. 2854

2397. A section of the right lower extremity of an infant, removed by amputation at the hip-joint for diffuse nævo-lipoma, and injected. The skin is unaltered, except on the anterior aspect of the thigh, where the section passes through a cutaneous nævus, 10 cm. in length, which is slightly raised and sharply circumscribed. The section of the limb shows a considerable increase in the thickness of the subcutaneous tissue; this is most marked in the thigh and on the anterior aspect of the leg, where it forms a layer more than 2 cm. in thickness. The subcutaneous fat is mixed with a spongy fibrous tissue, in which are a number of vessels presenting a diameter of 4 or 5 mm. Beneath the cutaneous nævus above mentioned the subcutaneous tissue is nævoid in its whole thickness and shows the section of a vessel 9 mm. in diameter. The muscular tissue, especially of the calf and back of the thigh, is largely mixed with fat, containing deeply injected areas of nævoid growth and presenting large vessels similar to those present in the subcutaneous tissue. In some parts the vessels are so abundant as to produce an almost spongy appearance.

The bones are normal, except that the tibia presents an undue curvature forwards. 5872

Microscopic Structure.—A section through the nævus of the skin of the thigh shows that a large excess of fat is present, in which are large numbers of capillary blood-vessels, some of which present considerable dilatations. Superficially the dilated vessels extend up into the papillæ. A section through one of the large deeply-seated vessels shows an endothelial layer and a fibro-muscular wall, but no elastic lamina.

From a male infant, 14 months of age, who was admitted into U. C. H. under the care of Mr. Marshall, Feb 27, 1882. The whole of the right lower limb was much enlarged, apparently as the result of diffuse thickening of the subcutaneous tissues. There was a large cutaneous nævus occupying nearly the whole of the outer aspect of the thigh and smaller nævi were present near the inner condyle of the femur, on the dorsum of the foot, and on the extremities of the 4th and 5th toes. Large veins could everywhere be seen through the skin. The glans penis was "slightly nævoid." The enlargement of the limb existed at birth and seemed to increase out of proportion to the growth of the child. The child left the hospital, but was readmitted on Jan. 10,1883, the condition of the limb being unaltered. Amputation at the hip-joint was performed on Jan. 16, but death occurred a few hours afterwards. (Mr. Marshall's *Case-books*, 1883, vol. ii, p. 259.)

Lymphangioma. Lymphatic Nævus.

Lymphangiomata are probably always congenital in origin. They are met with in two forms, the capillary and the cystic or cavernous.

The *capillary lymphangioma* is rare; it occurs as a small, pale, slightly raised tumour of the skin, on the surface of which bead-like dilated lymphatic vessels may be present; considerable quantities of lymph may escape if the tumour is punctured.

The *cystic or cavernous lymphangioma* is more common and is most frequently met with in the neck. Occasionally it occurs in the form of a single thin-walled cyst containing clear lymph (hydrocele of the neck), but more often the tumour is multilocular and composed of large numbers of thin-walled cysts lined with flattened endothelium and mixed with a varying amount of connective tissue containing fat (cystic hygroma, 2398–2401). These multilocular cystic forms of lymphangioma may reach a large size, but they show a marked tendency eventually to shrink and disappear. This change is not infrequently preceded by recurring attacks of inflammation, during which the tumour swells up considerably and the overlying skin becomes red and œdematous.

2398. A cystic lymphangioma from the clavicular region. The tumour is of a long oval form measuring 10 cm. in length. It has been laid open by a longitudinal incision. The surface of the tumour is irregular. It has evidently had no capsule, and has been removed with some of the areolar tissue and fat surrounding it. The section shows a coarse sponge-like texture made up of innumerable thin-walled spaces, lined by a smooth membrane, and communicating one with another. At one end of the tumour are several large spaces, which also intercommunicate. The inner surface of one of these is marked by numerous openings leading into smaller spaces. At the end opposite the larger cysts there is a more abundant fibrous tissue between the spaces. 4793

The tumour was removed by Mr. Liston from a boy, aged 13.

2399. Part of a cystic lymphangioma from the neck. The cysts have been distended and the specimen dried. The tumour seems to have been composed of a number of thin-walled cysts lying in close contact one with another. The largest cyst is more than 4 cm. in diameter. The cysts are mostly globular in form; some are completely closed, others communicate by free openings with those in contact with them. There is but little solid tissue between the cysts; the dried specimen is translucent in all parts. One of the descending branches of the cervical plexus has been removed with the tumour and is adherent to the front of the specimen. 3359

The tumour was removed by Mr. Liston from the neck of a man, aged 30, who had been aware of its presence for only two years and a half, but when he first noticed it the swelling was about as large as the palm of his hand and flattened. It increased gradually in size. At the operation the skin was found to be loose and healthy, but the tumour extended under the trapezius and sterno-mastoid muscles, and was crossed by some of the descending superficial branches of the cervical plexus; it was closely adherent to the carotid sheath, so that the jugular vein was exposed and laid bare. The tumour consisted of about a dozen cysts containing a thin, yellowish, transparent, albuminous fluid. One cyst was punctured during the operation.

2400. A piece of skin with part of a flat oval tumour attached to its deep surface. The part of the tumour preserved measures 7 cm. by 3·5 cm. The skin presents an unusually corrugated appearance. The outline of the tumour is tolerably well defined, but it has not been cleanly separable from the surrounding fat, some of which adheres to it. The cut surface of the tumour shows a fine alveolar or spongy texture, which is also seen in the substance of the skin itself. The spaces reach in some parts 3 mm. in diameter. They are smooth internally and freely intercommunicate. The contents have escaped. 51

Microscopic Structure.—The tumour is composed of wavy bundles of fibrous tissue continuous superficially with those of the cutis. Amongst the bundles are numerous spaces; they are lined by an imperfect endothelial layer. Numerous vessels penetrate amongst the bundles of fibrous tissue, and sweat-glands extend down into it from the surface. The growth is apparently a lymphangioma. The imperfect endothelial lining, the size of the spaces, healthy condition of the skin, and absence of blood in the spaces show that it is not a cavernous angioma.

2401. A cystic lymphangioma removed by operation from the chest-wall. It forms a flat growth, 4 cm. in diameter and is in most parts fibrous in appearance. On the deep aspect of the specimen, a cyst, about 1·5 cm. in diameter, has been opened; below it is a smaller one, and along one border some fibres of the serratus magnus are seen. On the surface of a section which has been made through the upper part of the specimen, some small cysts containing coagulated lymph can be seen. 6928

Microscopic Structure.—The interior of one of the cysts stained with nitrate of silver showed an endothelial lining, the cells having a wavy outline characteristic of lymphatic endothelium. The solid part of the tumour consists of fibrous tissue containing groups of fat-cells. The smaller spaces have no definite wall, but the larger cysts are surrounded by a dense fibrous layer in which there appear to be numbers of unstriped muscle-cells.

The tumour was removed from the chest-wall of a female child, aged 2 years. It was situated below and behind the posterior fold of the right axilla, and since birth had increased from the size of a pea to that of a walnut. It lay beneath the subcutaneous fat and was adherent to the surface of the serratus magnus. (Mr. Barker and Mr. Godlee's *Case-books*, 1892, vol. ii, p. 518.)

PAPILLOMA OF THE SKIN.

Papillomata are tumours which, from their structure, may be regarded merely as an abnormal outgrowth of the normal papillæ of the skin. A papilla is composed of a basis of delicate vascular connective tissue, often containing the commencement of a lymphatic vessel, and covered superficially by epithelium. In all true papillomata the same structures are met with in the same relation one to another, but variously modified. The following are the chief forms of papilloma met with on the skin :—

1. *The simple Wart.*—In this all parts of the papilla are usually equally increased in amount. The papillæ are covered by a thick layer of epithelium, which may accumulate in the form of globes between them. Simple warts are most common on the hands.

2. *A Corn* is an overgrowth of the papillæ with a very exaggerated formation of the horny layer of the epithelium, occurring as the result of repeated friction or pressure. In the centre of the corn the horny layer becomes converted into a hard conical plug; around this the papillæ are enlarged, but those situated immediately beneath it become much atrophied. Beneath a corn, in the subcutaneous tissue, it is common to find a small false bursa. This is a space formed by the coalescence of a number of the lymph-spaces of the connective tissue. The space thus formed contains a small quantity of serous fluid, and the areolar tissue around is slightly thickened and pressed together, forming an imperfect wall (2403).

3. *Venereal Warts.*—These occur most frequently on the vulva of the female and on the penis of the male, and are the result of the irritation of venereal discharges (2404–2406). The enlarged papillæ of these warts are often branched more than once, forming a mass like the head of a cauliflower. They are very vascular. The epithelial covering is thin, and the surface is often moistened by a small quantity of fluid exuding from it.

4. *The pigmented Papilloma or Mole.*—This is usually congenital. It is merely a patch of skin in which there is an abnormal development of pigment in the deep layers of the epithelium. At the same time, in most cases, the whole structure of the affected area is coarser than natural. The papillæ are larger, the epithelium thicker, and coarse hairs often spring from the surface (2407, 2408).

5. *Horns.*—A true horn is produced by a group of enlarged papillæ, on the surface of which a rapid epithelial growth takes place, the dried cells accumulating and forming a horn-like projection (2409, 2410). Another form of cutaneous horn is formed by the dried contents of a sebaceous cyst projecting through an opening in the cyst-wall (2458).

Papillomata of the skin occasionally serve as the origin of malignant growths. The most common example of this transformation is the development of melanotic sarcoma in a pigmented mole (2431). Other examples of sarcomata of the skin arising apparently from a papilloma are shown in Nos. 2424 and 2425.

2402. A small papilloma with the skin from which it springs. It is oval in form, measuring 1·5 cm. in length; it is composed of coarse papillæ rounded at their extremities and covered by a smooth layer of epithelium. The margin of the tumour overhangs the base of attachment. 123

2403. A hammer-toe, removed by operation and preserved in order to show the corn which has formed on the dorsal surface of the flexed joint between the two first phalanges. The cavity of a small bursal space beneath the corn has been displayed by an incision.

2404. A large number of venereal warts removed from the labia and surrounding skin. Each tumour presents the appearance of a small cauliflower-head, being formed of coarse, branching, closely packed, club-shaped papillæ springing from a short pedicle. 1910

The growths were probably the result of the irritation of gonorrhœal discharges.

2405. A large rounded mass of venereal warts removed from the labia, presenting an exact resemblance to the head of a cauliflower. The main pedicle from which the growth springs is situated in the deep hollow on one side of the specimen. The smaller papillæ on the surface are club-shaped and mostly about 2 mm. in diameter; they are smoothly covered by epithelium and nowhere ulcerating. The whole mass measures 7 cm. in diameter.

2406. A wax model of the vulva with large warty growths. The growths form two long papillary masses, one corresponding to each labium, reaching from the mons veneris to the anus. The papillæ composing the surface are coarse, many reaching 5 mm. in diameter. A few outlying masses are situated in the groins and at the anus. 4158

The patient was a girl, aged 18. The warts had been growing for ten months and followed gonorrhœa. They were successfully removed by Mr. Marshall with scissors.

2407. A pigmented hairy mole of the skin of the forehead removed by operation. The mole measures 4 cm. in length and 2·5 cm. in greatest breadth. The deeply pigmented surface of the mole is not raised or altered in texture. Large numbers of coarse hairs spring from it. 9709

From a patient under the care of Mr. H. J. Price, of Maldon.

2408. A piece of skin about 9 cm. in diameter, covered by a papillary growth of a slate-grey colour. The growth rises abruptly about 5 mm. above the level of the surrounding skin. It is composed of delicate closely set papillæ, amongst which are a few fine hairs. At one point about thirty papillæ have increased beyond the rest; they are club-shaped, measuring 3 mm. at their free ends, and project above the general level of the growth. These papillæ are smooth on the surface and colourless. One or two isolated papillæ have undergone a similar change.

Microscopic Structure.—The growth is a simple papilloma. The papillæ are composed of a delicate connective tissue surrounding a loop of vessels and covered by a layer of squamous epithelium. In the deeper layers of the epithelium is some dark brown pigment. The corium from which the papillæ spring is normal. The growth was most probably congenital, and would be described clinically as a papillary mole.

2409. A small horn, measuring 1·5 cm. in length, in section. It is of a dark grey colour. Its surface has an indistinct papillary arrangement. The section shows a small cavity in the centre; superficially it is composed of fine laminæ parallel to the surface. 34

2410. A wax model of the left hand of a child, on the dorsum of which is a horny growth. The horn is situated over the head of the metacarpal bone of the middle finger; it is conical, measuring 1 cm. in height and having a diameter of 1 cm. at its base. 4350

SARCOMA OF THE SKIN AND SUBCUTANEOUS TISSUES.

Sarcoma of the skin and subcutaneous tissues is of common occurrence. The varieties most frequently met with in the cutis are fibro-sarcoma, spindle-cell sarcoma, alveolar sarcoma, and melanotic sarcoma. The round-cell and mixed-cell growths are much less common in the skin itself, but are of frequent occurrence in the subcutaneous and deep planes of connective tissue. The malignancy of sarcoma of the skin is often manifested by the development of multiple nodules in the neighbourhood of the primary growth. Secondary deposits are also common in the lymphatic glands.

The skin is frequently invaded by a sarcoma beginning in the deeper structures.

Fibro-sarcoma and Spindle-cell Sarcoma.

These forms are common in the skin and subcutaneous tissue, and are very frequently multiple. They include the tumours that were at one time spoken of as "recurrent fibroid tumours of the skin." The abdominal wall, especially in the female, is a common situation for this form of sarcoma (2412, 2413).

2411. A piece of skin measuring 8 cm. by 5 cm., with the subcutaneous fat. The surface of the skin is rendered uneven by several tumours apparently springing from the corium. At the upper part of the specimen are numerous, small, rounded elevations about 5 mm. in diameter; they are but slightly raised above the level of the surrounding skin and smoother than the healthy integument. At the lower part are three large nodules: one of these is irregularly lobulated on the surface and in parts covered by coarse papillæ; it is slightly constricted at the base and rises 13 mm. above the surrounding skin. Immediately below this is a smooth round mass, part only of which is preserved; it is about the size and shape of a pigeon's egg and is attached by a narrow base. On one side of this is a small smooth elevation. All these tumours are covered by an epithelial layer. Beneath, and continuous with them, is a mass extending into the subcutaneous fat; it is irregularly lobulated and has an ill-defined outline. The cut surfaces of the tumour show an indistinctly fibrous structure.

Microscopic Structure.—The tumour is composed of imperfectly developed fibrous tissue, containing great numbers of small oat-shaped cells. The fibres and cells form about equal parts of the growth. The vessels are not abundant. The tumour is a fibro-sarcoma.

2412. An irregularly elliptical piece of the skin of the abdominal wall, 12 cm. in length, together with the subcutaneous fat and several spindle-cell sarcomata, which have probably originated in the corium. In the upper half of the specimen the tumours are small and form slightly raised smooth elevations on the surface of the skin; several of these, which are arranged in a linear series, have been divided by an incision; they are intimately connected with the skin and present a slightly fibrous appearance. In the lower part of the specimen is a much larger oval tumour, measuring 4·5 cm. in its longest diameter; in its general characters it presents appearances similar to the smaller tumours, but to the naked eye the cut surface presents a homogeneous instead of a fibrous structure. 6552

Microscopic Structure.—The growth consists of small cells of various shapes lying in a finely granular matrix; small spindle-cells predominate.

From a woman, aged 52, in whom a hard white growth as large as a pea was noticed in the lower part of the abdominal wall after the birth of her second child, at the age of 30. Four years later another small tumour appeared and the two coalesced. Other tumours subsequently developed. The tumours were arranged in an oblique line below the umbilicus. The skin over the most prominent part of the largest tumour was purplish in colour. There was no glandular enlargement. The parts preserved in the specimen were removed by operation. (Surg. Reg. Rep. 1890, p. 135, No. 813.)

2413. An elliptical piece of the skin of the abdominal wall, 9 cm. in length, together with the subcutaneous fat and a spindle-cell sarcoma, in section. The tumour, which appears to have originated in the corium, measures 3 cm. in its longest diameter; it causes a distinct prominence of the cutaneous surface and the superficial layer of the skin can be traced continuously over it. On its deep aspect the outline of the tumour is well defined, but cannot be readily separated from the surrounding fat. The cut surface of the tumour is convex. Beyond the upper border of the tumour an extension of the growth is seen in the deep layers of the skin. 7549

Microscopic Structure.—The tumour is a small spindle-cell sarcoma.

2414. A spindle-cell sarcoma of the skin of the thigh. The tumour has a very irregular outline and a maximum diameter of 7·5 cm. It is raised at its most prominent part to a height of 2 cm. The surface of the growth is nodular and superficially ulcerated; in some parts the ulceration does not extend quite up to the edge of the growth, but in most places the ulceration extends beyond the apparent limit of the growth into the surrounding skin, this being especially noticeable at the lower edge of the tumour and beneath two overhanging lobes. 6651

Microscopic Structure.—The tumour consists of large and small spindle-cells lying in a delicate fibrous stroma.

From a man, aged 73, who was admitted into U. C. H. under the care of Mr. Beck in 1891. The growth, which was situated on the outer side of the right thigh, was first noticed as a lump, the size of a pea, six years previously. A year before admission the tumour was removed, when it was as large as a duck's egg, but it soon recurred and was twice cauterised. The growth moved freely on the deep structures; the inguinal and iliac glands were rather larger than on the opposite side. The wound left by the removal of the tumour was allowed to heal by granulation. (Surg. Reg. Rep. 1891, p. 200, No. 401.)

2415. The lower third of a left thigh and the upper third of the leg, with a large spindle-cell sarcoma filling the popliteal space, in oblique section. The knee is flexed to a right angle. The tumour fills the popliteal space, and forms a large projection to the outer side. The upper border of the tumour is shelving, and the lower overhanging to the extent of 4 cm. The skin covering it is stretched and smooth, but not ulcerated. In the skin of the calf is a wide, irregular, elevated scar about 5 cm. in length. The cut surface of the tumour measures 11 cm. from above downwards by 8 cm. transversely. Its outline is clearly defined. Where it touches the vastus externus it is limited by a distinct fibrous capsule; this capsule is less distinct where it is in contact with the fat of the popliteal space. Superficially the growth is in immediate contact with the skin, which is inseparably blended with it. Towards the upper part there is an irregular cyst measuring about 3 cm. in length, formed by softening of the substance of the tumour. Below this is an area in which numerous brownish dots and lines are scattered through the yellow tissue; these are small extravasations of blood. The tumour, though close to the bones in some places, does not implicate them or their periosteum.

Microscopic Structure.—The tumour is a small spindle-cell sarcoma.

There is no history to the specimen, but the tumour is probably a recurrent growth, the scar in the skin indicating the position from which the primary growth had been removed.

2416. A section of a tumour of the skin, together with some of the subcutaneous fat. The tumour consists of two parts continuous one with the other. The upper and smaller portion rises at its centre to the extent of 1·5 cm. above the level of the surrounding skin; the periphery is covered with coarse papillæ, which in some parts slightly overhang the surrounding skin. The lower and larger portion of the tumour measures 5 cm. in length and has a striking resemblance to a tongue. Its surface is slightly papillary at the margin, especially at the upper extremity, where the tumour is attached; the whole surface appears to be covered by a thin epithelial layer, except at one spot where ulceration is commencing. The cut surface is firm and homogeneous, and the section through the subcutaneous fat shows that the tumour-substance is extending into it.

Microscopic Structure.—The tumour is composed of very imperfectly developed fibrous tissue, with large numbers of oat-shaped and small round cells. The fibres are arranged in bundles, and in some parts concentrically, in others in intersecting wavy lines. Some large vessels with well-developed muscular coats traverse the mass. The tumour is a fibro-sarcoma.

SMALL ROUND-CELL SARCOMA.

Small round-cell sarcoma does not often occur as a primary growth in the skin, although it is not uncommon in the subcutaneous and deeper planes of connective tissue (2418). Nodules having the structure of lympho-sarcoma may be met with in cases of lymphadenoma pursuing a malignant course.

2417. A piece of skin with the nipple, subcutaneous tissue, and part of the pectoral muscle, removed after death from the right side of the chest of a man. In the natural position of the parts the piece of skin extended from the middle line to the axillary region. A large number of rounded or oval sarcomata, varying in size, lie scattered through the subcutaneous tissue. The smaller nodules have no connexion with the skin, but the larger have become adherent to it. The tumours are soft and spongy in texture; their limits are tolerably clearly defined, but they cannot be separated from the tissues surrounding them.

Microscopic Structure.—The tumours are small round-cell sarcomata.

From a man who was under the care of Dr. Walshe, by whom, according to the nomenclature of the time. the tumours were described as "soft cancers." Similar growths were found among the nerves of the brachial and cervical plexuses (Nos. 1137, 1138), in the walls of the external jugular vein and inferior vena cava (Nos. 1314, 1315), and in the heart (see Medical Catalogue). (Med. Times and Gaz. 1852, vol. ii, Aug. 21 and 28.)

2418. Part of the leg of a child, which was removed by amputation for recurrent sarcoma of the skin. An incision has been made behind to show a large soft tumour occupying the upper part of the calf, and measuring 7 cm. in length. The skin covering the tumour is thinned and stretched and adherent to it. The growth has invaded and partly destroyed the upper part of the gastrocnemius and soleus. The substance of the tumour is soft; the cut surface is ragged, and apparently in parts the growth is degenerating and broken down by hæmorrhage. Its border below, where it implicates the muscles, is ill-defined.

Microscopic Structure.—The tumour is a small round-cell sarcoma.

The patient was a little girl, who was admitted into U. C. H., under the care of Sir Henry Thompson, in September 1861, for a small freely movable tumour in the upper part of the calf of the leg. It was removed, and the wound healed. Three months afterwards, Sir J. Erichsen amputated through the lower third of the thigh for a recurrence of the growth in the scar. When fresh, the tumour presented the appearance of rather soft brain-like matter. The mass occupied the upper parts of the gastrocnemius and soleus muscles, extending through their whole thickness down to the bone. The knee-joint was healthy. The child recovered from the operation, but died on February 14, 1862, of secondary growths in the lungs and pleura. One iliac gland was enlarged on the same side as the tumour.

2419. Half a recurrent sarcoma with the skin covering it and parts of some of the muscles of the front of the thigh. The tumour implicates the skin in the line of a scar, part of which can be seen at one end of the specimen. It forms a rounded prominence about 7 cm. in length and projecting for 2 cm. above the level of the skin. The surface of the projection is smooth and still covered by a very thin cutaneous layer, except on a small portion of the most prominent part where ulceration has commenced. The section shows that the projection is part of a large tumour measuring 14 cm. by 7 cm. The tumour consists of several rounded lobules which have penetrated amongst the muscles so that muscular fibres can be recognised almost in the middle of the growth. The deep surface of the tumour is also adherent to the muscular tissue, a considerable mass of which has been removed. The edge of the tumour is ill-defined; its structure is very soft, in parts almost granular from degeneration. It is intersected here and there by bands of fibrous tissue. It is white in colour and there are several small cysts scattered through it. 4906

Microscopic Structure.—The tumour is a mixed small, round, and spindle-cell sarcoma.

The tumour was removed by Mr. Liston from the front part of the thigh of a man, aged 40. A similar tumour had been removed from the same place some time before. Recurrence again occurred and twelve months after the second operation amputation was performed through the hip-joint. Gangrene of the flaps occurred and the patient died.

2420. The upper half of a right tibia and fibula with the soft parts of the corresponding portion of the front of the limb removed by amputation for recurrent sarcoma of the skin. In the skin, a little to the outer side of the middle line, is a scar 12 cm. in length. At the upper end of the scar an oval tumour, measuring 3·5 cm. in length by 2·3 cm. transversely, projects for about 1·3 cm. above the level of the surrounding skin. An incision has been made into it. It is covered by a very thin unbroken cutaneous layer. Its substance is very soft, granular on section, and stained by blood. At the bottom of the incision is a dark mass, apparently pure blood-clot. Below this and to the outer side of the scar a flap of skin has been turned down and a deep cavity is exposed 3·5 cm. long. At the bottom of this the deep fascia of the limb is seen deeply indented. This cavity was, in the fresh state, filled with a tumour similar in structure to that described above. Internal to the scar are two much smaller slightly projecting tumours, and external to the cavity above described another tumour is growing from the deep aspect of the skin.

Microscopic Structure.—The tumours are composed of round and spindle-shaped cells mixed with a large quantity of extravasated blood. In the fresh state the blood in many parts of the tumour was so abundant that the mass resembled pure blood-clot in colour, and it was only by the microscope that the presence of the cells of the sarcoma mixed with the extravasated blood could be recognised. The tumours were not connected with either bone.

From a man, aged 40, who was admitted into U. C. H., under the care of Sir J. Erichsen, in January 1875. There was a tumour over the upper extremity of the tibia, slightly raised and about 3 inches in diameter. It fluctuated distinctly, and a small quantity of dark red fluid was oozing from two small openings in the skin. It was incised, and a quantity of soft solid substance, at first sight resembling pure blood-clot, was scooped out. On careful examination a number of round and spindle-cells were found mixed with the blood. The tumour was a so-called "sarcomatous blood-cyst," that is to say, a soft very vascular sarcoma, so completely broken down by hæmorrhage into its substance as to resemble a cyst filled with blood. The growth speedily recurred and the limb was successfully amputated through the condyles of the femur some months afterwards. (Godlee, Trans. Path. Soc. vol. xxvi, 1875, p. 193.)

Alveolar Sarcoma of the Skin.

An alveolar sarcoma is composed of cells usually of considerable size and of rounded form with large clear round or oval nuclei; these cells lie in a stroma of fibrous tissue, arranged in bands of some thickness, forming alveolar spaces; from these coarser bands delicate processes of the stroma penetrate amongst the cells, thus distinguishing the growth from a carcinoma.

Alveolar sarcoma of the skin is a rare disease. The growth commences in the cutis, and forms a rounded projecting tumour, smooth on the surface and covered superficially by the stretched papillary layer of the skin and the epithelium (2426).

Small ramifying vessels are commonly seen immediately beneath the epithelium. The tumours are usually multiple, and of almost stony hardness. If left alone they most commonly ulcerate after reaching about ¾ inch in diameter (2422). They show little tendency to penetrate deeply into the subcutaneous tissue. The disease usually proves fatal by the formation of secondary tumours in internal organs.

The sarcomatous tumours of the skin which occasionally develop from a papilloma are often of the alveolar variety; such tumours are not uncommonly pigmented (*see* Melanotic Sarcoma).

2421. The anterior part of a foot from the tarso-metatarsal articulation. Opposite the head of the metatarsal bone of the great toe is a tumour shaped like the head of a mushroom. An incision has been carried through the tumour into the space between the first two metatarsal bones. The tumour measures 5 cm. in length, and is attached by a pedicle measuring a little more than 3 cm. in diameter. It projects 2 cm. above the level of the surrounding skin. Its surface is lobulated and superficially ulcerating; its base penetrates but a short distance into the subcutaneous fat. The structure of the tumour is soft, and is marked by lines radiating from the pedicle to the surface. Immediately above the main mass are two similar growths measuring 2 cm. and 1 cm. in diameter. The section has passed through the larger of these and shows that it springs from the cutis vera, and scarcely extends into the subcutaneous fat. A smaller growth, scarcely raised above the surface, lies to the outer side of the incision.

Microscopic Structure.—The tumour is an alveolar sarcoma. It is composed of groups of round cells lying in the meshes of a stroma forming coarse alveoli subdivided by finer processes running amongst the cells.

2422. An oval tumour measuring 5·5 cm. by 3 cm., and the skin covering it, in section. The tumour has perforated the skin by a circular opening 3 cm. in diameter, and forms a rounded projection through it. The skin up to the margin of the opening is healthy. The edges of the opening are sharply cut and slightly undermined. The deep surface of the tumour is clearly defined, but is adhering to the surrounding fat. The incision carried through the tumour shows no definite structure. It is for the most part firm, but scattered here and there are small softened areas occupied by granular débris. The projecting part shows no definite structure, and is darkly stained with blood.

Microscopic Structure.—The tumour is so broken down by hæmorrhage into its substance that it is difficult to ascertain its exact structure. It seems to have been composed of round cells about four times the size of a red corpuscle lying in a reticulate stroma of fibrous tissue. It is probably an alveolar sarcoma.

2423. An index finger, amputated for a tumour situated in the soft parts covering the outer and palmar aspects of the distal half of the metacarpal bone. The specimen has been partially injected with carmine. An incision, which opens the sheath of the flexor tendons, has been carried through the tumour. Superficially the tumour has implicated the skin, and broken down, forming an irregular ulcer; the edges of the ulcer are raised, but not everted; the floor is depressed below the level of the edges. The section shows that the tumour extends to the sheath of the flexor tendons, but does not implicate the bone. Its outline is well-defined, but it is evidently invading the surrounding fat. The cut surface is smooth and indistinctly fibrous in structure.

Microscopic Structure.—The greater part of the mass is formed of imperfectly developed fibrous tissue containing numerous round and oat-shaped cells. Scattered through this are areas in which the cells are large, with clear oval nuclei, and with so little stroma between them as at first sight to resemble masses of epithelium. This resemblance is increased in some places by a concentric arrangement of the cells, producing an appearance like epithelial nests. On careful examination, however, the stroma can be seen to penetrate amongst these cells, and every transitional stage can be found between the imperfectly developed fibrous tissue and the pure cellular areas. The tumour is therefore a fibro-sarcoma, tending in parts to assume the structure of alveolar sarcoma.

2424. A tumour with a small piece of the skin from which it arises. The tumour is of an irregular globular form and measures 4 cm. in diameter. It is attached to the skin by a narrow oval base measuring 2·5 cm. by 1·5 cm. The tumour consists of two parts. The larger is lobulated and covered by a smooth epithelial layer; the smaller, close to the base of the growth, is coarsely papillated. Their surface is free from ulceration. A section carried through the larger part shows a spongy alveolar structure. The warty part consists of branching papillæ, some about 4 mm. in length.

Microscopic Structure.—The tumour is an alveolar sarcoma. It consists of a stroma of imperfectly developed fibrous tissue containing numerous oat-shaped and small round cells. This stroma forms alveolar spaces which are filled with round cells of considerable size with clear round nuclei. The alveoli are not sharply defined, processes of the stroma penetrating amongst the cells. In parts the cells and stroma are intimately mixed. Clinically, the tumour would be termed a sarcomatous wart.

2425. An oval piece of skin measuring 3 cm. by 1·5 cm. In the middle of it is a small lobulated tumour. The most projecting lobule is smooth on the surface; one of the others is covered on one side by papillæ, giving it the appearance of the surface of the tongue. Another group of papillæ is situated at one end of the tumour. The surface of the tumour is covered by an unbroken epithelial layer. An incision has been made through the tumour. It presents no definite structure to the naked eye. It replaces the cutis vera, but does not seem to have extended into the subcutaneous fat.

Microscopic Structure.—The tumour is an alveolar sarcoma. It is composed of imperfectly developed fibrous tissue forming a stroma, in some parts reticular, in others alveolar. The spaces of the stroma are filled by round cells about $\frac{1}{1000}$ inch in diameter, with clear round nuclei. The tumour-tissue is in direct contact with the epithelial covering, no trace of the cutis vera remaining. The tumour would be described clinically as a sarcomatous wart.

2426. A wax model of a left thigh and knee. Numerous rounded tumours, varying in diameter up to 5 cm., are scattered in the skin of the thigh in all parts, except the region corresponding to Scarpa's triangle. Some are scarcely raised above the level of the surrounding skin, others project for about 2 cm. Some are completely isolated, but others are arranged in groups. Over the smaller and flatter tumours the skin is purplish in colour, but otherwise healthy. Over some of the larger tumours the skin has given way, and the substance of the growth is exposed, covered with a sloughing layer mixed with blood. By the coalescence of several such areas of sloughing an ulcer, measuring 6 cm. by 3·5 cm., has been formed above the knee on the inner side of the thigh. The ulcer is oval in form, and except on one side it is surrounded by a number of rounded tumours. The edges of the ulcer are elevated, and sink abruptly to the surface of the sore, which is covered by a sloughing layer mixed with blood. A larger ulcer, presenting much the same appearance, is shown on the outer and posterior aspect of the thigh in the upper part of the lower third. There is no apparent enlargement of the glands in the groin. 2734 A

There is no history to the model. It is described in the old Catalogue as "carcinoma of the skin." The tumours evidently arose in the cutis; they were most probably alveolar sarcomata. The absence of glandular enlargement, the size the tumours have reached before ulceration, their multiplicity, and the situation in which they grew, point to their having been sarcomatous rather than carcinomatous.

MELANOTIC SARCOMA OF THE SKIN.

Melanotic sarcoma is composed in most cases of mixed spindle and round cells, with scarcely any stroma between them. The dark colour is due to granules of brown pigment in the cells. In most cases only a certain proportion of the cells contain pigment, the remainder being colourless. Melanotic growths of the skin, especially those commencing in congenital pigmented moles, frequently present an alveolar arrangement of the cells, which are large and rounded in shape. Considerable difference of opinion exists among pathologists as to whether the pigmented growths of this variety should be regarded as alveolar sarcomata or carcinomata.

In its early stages a melanotic sarcoma forms a smooth lobulated projection on the surface still covered by the epithelium, through which the dark colour of the growth beneath is perceptible. A section through such a tumour shows that the new growth has invaded the corium and occupied its place (2428). The fat beneath is also displaced to a varying extent by the growth, but not apparently invaded by it. The tumour is soft in consistence, and its outline is sharply circumscribed; but the growth is very rarely separated from the surrounding parts by a distinct capsule of areolar tissue. It is rarely of an uniform black colour; most commonly it is marked by streaks radiating from the base to the surface (2429). If the tumour be left to itself the epithelial covering after a time gives way and ulceration takes place (2427).

Melanotic sarcoma is extremely malignant. It has a great tendency to infect the neighbouring skin, apparently through the lymphatics, and thus the primary tumour may become surrounded by numerous smaller growths (2427, 2428).

The lymphatic glands are usually affected at an early stage of the disease, and the secondary glandular tumour may reach a considerable size whilst the primary growth in the skin is still inconspicuous (1328); this is a striking feature in the variety of melanotic growth which occasionally originates in the matrix of the nail (melanotic whitlow, 741). Secondary tumours usually appear at an early period in almost every internal organ and not uncommonly in the bones (742).

2427. The inner half of the posterior part of a right foot and the lower three inches of the leg amputated for multiple melanotic sarcomata of the skin. The chief group is situated in the sole near the middle line, just in front of the heel; it is composed of about twenty small round tumours closely set together in an area measuring about 3 cm. in diameter. Some are distinct and some coalescing at their margins. They are rounded in form and vary in diameter from 3 mm. to 1·5 cm. The most prominent reach an elevation of 5 mm. above the surface of the surrounding skin. They are of a pale brownish colour. They are ulcerating superficially, and in the larger growths the ulceration has penetrated more deeply in the centre, forming a small pit. Isolated growths of the same kind are scattered in the skin around the central group as far forward as the middle of the foot, back to the heel, and as high as the inner malleolus. A small dusky spot, scarcely elevated above the surface, is situated immediately below the upper limit of the skin preserved. Altogether there are nearly fifty separate growths. The section carried along the sole of the foot shows that the tumours are very superficial, scarcely extending beyond the cutis vera.

Microscopic Structure.—The growth is a mixed-cell pigmented sarcoma, having in parts a slightly alveolar arrangement.

From a man, aged 51, who was admitted into U. C. H. on Feb. 5, 1884, under Mr. Heath. Three years before admission he had been kicked on the foot, and one year subsequently a small black spot appeared, causing much pain. A year after its first appearance he consulted a doctor, who "pricked" the growth and recommended rest; three weeks later he was admitted into the Boston Cottage Hospital, and the growth was removed; but the wound did not heal, and a fungous mass protruded. This was at the end of May 1883; in October he was readmitted, and the tumour was scraped away and the cautery applied; the wound healed up in twelve weeks. Six weeks later he noticed other black spots on the foot, and these continued growing. The inguinal glands became enlarged five weeks before admission.

On Feb. 6, 1884, Mr. Heath amputated the leg at the junction of the middle and upper thirds, and the glands were removed from the groin. On Feb. 21 erysipelas attacked the wound in the groin, but the wounds were quite healed by March 2; on March 15 there were numerous black spots about the size of a pin's head on the outer part of the leg, just below the knee; these gradually increased, and in June the patient died suddenly; but the cause is not stated in the notes. (Surg. Reg. Rep. 1884, p. 70, No. 293.)

2428. A strip of skin, 13 cm. long by 3 cm. wide, containing large numbers of melanotic sarcomata, varying in size up to 1·5 cm. in diameter. The skin is, moreover, pigmented in patches, which at the upper part of the specimen are scattered and irregular in form, but at the lower part are confluent, so as to leave only a few uncoloured spots. The smaller tumours can be seen in the cut edge of the skin, forming small black dots in the cutis vera immediately beneath the cuticle. The larger tumours form rounded elevations on the surface. The cuticle has separated from over one of these, and the black substance of the tumour is exposed. The deep surface of the specimen shows the tumours seated in the cutis vera. No subcutaneous fat has been preserved. The tumours are covered by a thin fibrous layer, through which the dark substance can be clearly seen. One or two of the larger tumours are seen in section at the edges of the specimen, and show clearly the situation of the growths in the cutis vera. 45

2429. A pigmented sarcoma of the skin. The tumour is oval in form and measures 4·5 cm. by 4 cm. It forms a mushroom-like mass about 1·5 cm. in thickness, attached to the skin by a pedicle nearly 3 cm. in diameter. Its surface is lobulated and everywhere devoid of cutaneous covering. The section shows that the tumour does not penetrate into the subcutaneous tissue. Its structure is soft and marked by coarse black lines, mostly radiating towards the surface from the pedicle. On one side of the section these are in contact, forming an uniformly black area about 2 cm. wide. The rest of the tumour is of a dirty-white colour. A similar tumour, 8 mm. in diameter, lies in the skin close to the larger growth.

Microscopic Structure.—The tumour is a melanotic sarcoma. The tumour-cells are small and irregular, but, except in the case of those which are swollen by the deposit of pigment within them, small spindle-shaped cells predominate.

2430. An oval piece of the scalp with a tumour growing in it and three lymphatic glands removed from the neck behind the sterno-mastoid. The piece of scalp measures 8 cm. in length by 4·5 cm. in breadth, and is almost entirely occupied by the new growth. This forms a tumour, on the most prominent part of which the skin is smooth and hairless, but not ulcerated. An incision has been made into the growth, which is 2 cm. thick at the most prominent part. It is of a pale greyish or, in parts, yellowish colour, but marked by streaks or patches of black pigment, the largest of which is about 1 cm. in diameter. The tumour is made up of small lobes, but beyond this it presents no definite structure to the naked eye. Its outline is badly defined from the fat of the scalp. At the most prominent part it has replaced the corium, and is covered merely by a thin epithelial covering. The opposite surface of the specimen shows the pericranial aponeurosis adherent to the tumour, but not penetrated by it. Some dark-coloured patches of the tumour can be seen through the aponeurosis. The three lymphatic glands have been laid open, and closely resemble the primary growth in appearance. The fat surrounding the glands is adherent to them, and is evidently invaded by the growth. A piece of the spinal accessory nerve has been removed with the largest gland, and is embedded in the growth.

Microscopic Structure.—The tumour is composed of small spindle-cells and some round cells. A few of the cells grouped in patches contain dark brown pigment. The growth is a melanotic sarcoma, but the cells are smaller and the pigment less abundant than in most specimens of the kind.

From a woman, aged 59, who, except for the presence of the tumour, was in perfect health. As long as she could remember she had a small wart or mole on the scalp about 3 inches above and 1 inch behind the left ear. About eighteen months before the operation this began to increase in size. It was seen by a medical man, who ordered a seton to be passed through it. About ten months before the operation it was seen by a surgeon, who took it to be an atheromatous cyst, and ordered removal, but did not consider the case urgent. From that time it continued to grow with increasing rapidity, and two or three months before the operation other lumps appeared behind the ear and in the neck. In May 1886 the primary tumour presented the appearance seen in the specimen. The mastoid lymphatic gland was enlarged, and is the smallest of the three shown; it was not adherent to the skin. Below it, behind the sterno-mastoid, were the two other glands, the larger being lower down. The primary tumour was freely movable over the skull. There was no pain and little tenderness. The tumour was removed and the glands dissected out by Mr. Beck by an incision reaching from the top of the head to within 2 inches of the clavicle. There was little bleeding. Some difficulty was found in dissecting the glands from the surrounding parts, and the spinal accessory nerve was partly cut away. The wound came together easily except on the scalp, where an oval surface was left to granulate. The rest healed by first intention, and the patient went home on the fourteenth day.

2431. Half a melanotic sarcoma, originating in a pigmented mole of the skin of the back. The pigmented mole measures 9 cm. in length and presents a coarse warty surface. Attached to one extremity of this is a lobulated tumour, measuring 7 cm. in its greatest diameter and springing from the skin by a pedicle 2·5 cm. in diameter. One of the lobes of the tumour is separated from the rest by a very deep cleft. The cut surface of the tumour presents a marbled appearance, due to the presence of irregular areas of pigment. The pigmentation can also be seen on the surface of the growth, which appears to have at all parts an epithelial covering. Springing from the pigmented mole near the large tumour is a separate growth, 2 cm. in diameter; its characters are similar to those above described except that the pigmentation is absent. The subcutaneous tissue preserved in the specimen does not appear to be invaded by the growth. 6560

Microscopic Structure.—The tumour is a melanotic sarcoma. In most parts the stroma has a distinctly alveolar arrangement, the spaces being occupied by irregular cells. The cells in which pigment is present are considerably swollen.

From a woman, aged 28, who was under the care of Mr. Heath in U. C. H. in 1890. In the right dorsal region was a large congenital pigmented mole, from the inner extremity of which the tumour preserved in the specimen had been growing for three years. A moderately hard gland as large as a cherry was felt in the right axilla, and another as large as a pea in the left axilla. There were no other evidences of secondary growths. The growth, together with the pigmented mole, was excised. The glands were not removed. (Surg. Reg. Rep. 1890, p. 136, No. 1063.)

2432. A piece of skin from the groin of a horse. The skin is infiltrated by a diffuse sarcomatous growth about 3 cm. in thickness, ulcerating on the surface. In the midst of this is a sharply defined rounded mass, 3·5 cm. in diameter, which projects considerably above the ulcerating surface of the tumour. An incision has been made through it. It is darkly pigmented. In the centre, on one side of the section, is a paler part, from which lines radiate towards the circumference. The rest of the growth, where it forms the ragged ulcer, is free from pigmentation. 44

Sarcomata of the Deep Fasciæ.

2433. Half a tumour removed from amongst the muscles at the back of the neck. The tumour is of irregular form, and measures 8 cm. across the cut surface. The part of the natural surface shown is coarsely lobulated, flattened, and slightly concave in the centre. The tumour is enclosed in a loose capsule of areolar tissue, and has been cleanly removed from the surrounding parts. The cut surface is white in colour; it shows numerous lobes separated by bands of dense fibrous tissue. The bulk of the tumour presents no definite structure to the naked eye: it is for the most part firm in consistence and has cut smoothly. At the lower part the substance is softer and granular on section. Some vessels can be seen here and there in the fibrous tissue between the lobes.

Microscopic Structure.—In some parts the growth consists of small round cells lying in a homogeneous matrix, while in others the cells are few in number, and the tumour assumes myxomatous characters. The growth is therefore a myxo-sarcoma.

From a man, aged 64, who was admitted into U. C. H. on February 22, 1886. Five years previously he had suffered some pain at the nape of the neck, and soon noticed a small tumour, which was always quite fixed. The tumour increased gradually and steadily in size till six months ago, when it suddenly commenced to grow more rapidly, and had since doubled its size.

On admission the tumour extended from the anterior border of the left sterno-mastoid to the middle line of the neck behind. In an upward direction it reached as far as the superior curved line of the occipital bone, and downwards to the junction of the middle and lower thirds of a line drawn from the external occipital protuberance to the seventh cervical spine. The growth was quite fixed.

The tumour was removed by Mr. Barker on February 24. It was necessary to divide some of the fibres of the complexus muscle, and the growth was found to lie on the muscles in the suboccipital triangle, and to be very firmly adherent to them, and also to the transverse process of the axis, which was partly absorbed as the result of pressure. The whole growth was removed in its capsule, and the patient made a good recovery and left the hospital about the middle of March. (Surg. Reg. Rep. 1886, p. 128, No. 375.)

2434. A section of the lower half of a leg and the posterior part of the foot. The section shows a large oval sarcoma, measuring 13 cm. from above downwards by 5 cm. from before backwards. The tumour occupies the space between the deep and superficial muscles of the back of the leg at its upper part; below it is in contact with the posterior surface of the tibia, the astragalus, and the upper part of the os calcis. Posteriorly it is in contact with the tendo Achillis. Where the tumour is in contact with the muscle its surface is limited by a well-marked fibrous layer; where it touches the tendo Achillis its surface is smoothly lobulated and clearly defined. The tumour is composed of numerous rounded lobules with bands of fibrous tissue between them. The structure is, to the naked eye, homogeneous; it is white in colour and very soft. The skin preserved in the specimen is healthy, except at one place just above the heel, where there is a depressed, punctured opening which leads down to the tumour, probably the result of an exploratory incision.

Microscopic Structure.—The tumour is a mixed-cell sarcoma with very numerous vascular spaces.

There is no history to the specimen.

CARCINOMA OF THE SKIN.

SQUAMOUS-CELL CARCINOMA OF THE SKIN.

This is the common form of primary carcinoma of the skin. It is composed of branching columns of squamous epithelium, originally springing from that covering the cutis in the affected area. Between the columns is a vascular connective tissue, usually imperfectly developed and crowded with young cells, either round or fusiform. The flattened epithelium-cells, when subjected to mutual pressure, become arranged concentrically, those in the centre becoming dry and scaly, and thus the peculiar "bird's-nest" groups of cells so common in squamous carcinoma are formed.

A squamous carcinoma most commonly commences near the junction of skin and mucous membrane, as in the lip, anus, or penis; in other situations it most commonly originates in a scar or chronic ulcer (2437, 2442). As a special instance of carcinoma originating in a scar or ulcer may be mentioned its occasional occurrence as a complication of lupus. Carcinoma of the skin in chimney-sweeps (2169–2172) and that form occasionally met with in workers in tar and paraffin (2443) illustrate the development of the disease as a result of chronic irritation of the skin.

The form of the growth varies considerably; it may commence as a smooth hard elevation in the skin, at first covered by an unbroken layer of cuticle, but ulcerating very early. The growth spreads and invades the surrounding tissues, but the ulceration may follow so closely upon it that at no time is there any considerable mass of the new growth present. In other cases the new growth may penetrate deeply and rise considerably above the surface. When commencing in scars or at the margin of chronic ulcers the area affected may be very great, and the growth may assume a papillary form at its margin. In all forms the growth steadily advances and invades every structure with which it comes in contact (2436). The characteristic carcinomatous ulcer of the skin has a raised edge, sinking abruptly to the surrounding tissues and sometimes overlapping them; towards the ulcer the edge sinks more gradually (2437). The floor of the ulcer is irregular, in parts covered by grey or yellowish sloughs, and in others showing coarse florid granulations. The base is indurated and adherent to surrounding structures. If very small, the ulcer may be covered by an adherent scab. The growth presents on section a firm consistence and an opaque white colour, the surface being rendered coarsely granular or streaked by the columns of epithelial cells. To the naked eye the outline of the growth usually appears well-defined and the contrast between the white colour of the tumour and the surrounding tissues is usually striking.

Squamous carcinoma early affects the nearest lymphatic glands, but seldom gives rise to secondary growths in the viscera or bones.

2435. The lower part of a left leg and the adjacent part of the foot, in which a large ulcerating carcinoma is situated above the heel, injected. The growth extends more than halfway around the limb, extending farther forward on the outer than on the inner side, and has a maximum vertical measurement of 9 cm. The surface of the growth is covered with irregular projecting nodular masses, into most of which the injection has freely entered. The surface is in most parts ulcerated, but in some situations the nodular projections have a coarse warty surface, this being most noticeable at the border of the growth immediately above the heel. The edge of the growth varies in character in different parts: in some places it is abruptly raised and terminates in a well-defined ulcerated border; in other parts the edge of the growth is so much everted as to overhang the surrounding skin to the extent of 1 cm.

From a man, aged 46, who was admitted into U. C. H. under the care of Mr. Heath, Nov. 8, 1887. When 7 years old he had sprained the left ankle; the injury was followed by abscesses which continued to discharge for five years. In the beginning of 1887 an ulcer appeared above the heel; it was treated with caustics, but enlarged rapidly. On admission there was a large carcinomatous ulcer above the left heel and the glands in Scarpa's triangle were enlarged. On Nov. 30 amputation was performed below the knee-joint and the patient left the hospital on Jan. 5, 1888.

2436. The lower part of a left leg, with the posterior part of the foot, injected, the heel being the seat of a large squamous carcinoma, from the outer side of which a V-shaped piece has been removed. In the middle line posteriorly the tumour reaches to the level of the malleoli, and below it extends into the sole. The surface of the tumour is everywhere ulcerating: but the increase by growth has exceeded the destruction by ulceration, so that the whole surface is raised above the level of the surrounding parts. It is coarsely papillated, and the injection has entered readily into it, giving it a red colour. The edges are in most parts slightly everted, and sink abruptly to the surrounding skin. The section shows that the growth has destroyed and replaced the soft structures of the heel. The compact tissue of the adjacent part of the os calcis has been destroyed, and the tumour penetrates into the cancellous tissue of the bone.

There is no history to the specimen.

2437. Part of a left leg from the upper part of the calf to near the malleoli. On the outer side of the limb, extending for 20 cm. from above downwards, and in parts for 7 cm. transversely, is an ulcerating carcinoma. The growth is irregular in outline and divided into two parts by a narrow neck of skin near the lower part. The surrounding skin is excoriated by the irritation of the discharges in the immediate neighbourhood of the sore. Towards the anterior aspect of the limb there is a large slightly puckered cicatrix, apparently that of a burn; in this is a small isolated growth similar to the larger one already mentioned. The edges of the growth are abruptly raised above the surrounding skin ; in some parts they are everted, overlapping the neighbouring skin. The surface of the ulcer is irregular and everywhere raised above the normal level of the skin. In the middle part it is coarsely papillated.

The growth is a squamous carcinoma, evidently arising in the scar of an old burn.

2438. A left leg and foot, amputated for an ulcerating carcinoma and injected. The ulcer is irregularly circular in form and measures 14 cm. in diameter. It is situated on the antero-external aspect of the limb and reaches the middle line in front. Its upper border is 8 cm. below the level of the articular surface of the tibia. The skin surrounding the ulcer is for the most part redder than natural. In places the epidermis has separated, leaving a raw surface exposed. In other parts the skin is covered by a thickish opaque layer of sodden epithelium ; this is the effect of the irritation caused by the discharge from the sore. The edges of the ulcer are considerably raised above the surrounding parts and everted so as to overlap the surrounding skin. The surface of the ulcer is extremely irregular and for the greater part composed of coarse, closely packed papillæ, presenting much the appearance of the surface of the head of a cauliflower. The greater part of the sore is covered by whitish, opaque, sloughy tissue ; but here and there the injected vessels show through, giving the surface a bright red colour. 6105

From a man, aged 55, who was admitted into U. C. H. in 1885 under the care of Mr. Barker. The ulcer had existed for eight years, and commenced at the site of a scar from a dog-bite inflicted thirty-four years before. Previously it had been treated by cauterisation, lotions, and ointments. There was one enlarged femoral gland. Mr. Barker amputated at the knee-joint, but the patient died of tetanus. (Surg. Reg. Rep. 1885, p. 136, No. 501.)

2439. Part of a left leg in antero-posterior section through the upper part of the tibia. The section passes through an irregular cavity in the upper extremity of the bone and a large ulcerated carcinoma of the skin on the postero-internal aspect of the limb. The cavity in the tibia has a vertical measurement of 5 cm. ; it is irregularly loculated and lined by a smooth membrane except posteriorly, where in some parts the bony wall of the cavity is wanting and has evidently been destroyed by the extension of the growth in the overlying soft parts. Superficially the carcinoma appears as an irregular ulcer, having a maximum vertical measurement of 7 cm., but subdivided by two narrow bridges of undestroyed skin. The surface of the main part of the growth is irregularly papillary, and at the margin overhangs the adjacent skin to the extent of nearly 1 cm.* On the surface of the section the growth extends down to the posterior surface of the tibia and has a thickness of 3·5 cm. A small fragment of lead, which was firmly embedded in the wall of the cavity in the tibia, is preserved above the specimen. 6627

Microscopic Structure.—The growth is a typical squamous-cell carcinoma.

There is no history to the specimen, but it is probable that the chronic abscess in the upper end of the tibia followed a gun-shot wound of the bone and that the squamous carcinoma originated in a sinus leading through the skin.

2440. The anterior part of a foot, showing recurrence of the disease after amputation of the fourth toe for squamous carcinoma. In the scar of the operation and extending on the dorsum of the foot, at the root of the third toe, is an ulcerating growth, measuring 3·5 cm. in diameter. Above this is a smaller ulcer, 1 cm. in diameter. The edges of the ulcer are raised above the level of the surrounding skin by the invading growth. On the inner side of the large ulcer the edge is slightly everted ; it is covered by a thin layer of skin, on which enlarged papillæ can be clearly seen. The edges shelve gradually down to the surface of the ulcer, which is irregular and covered by a grey layer of sloughing tissue. Above the smaller ulcer is a small rounded elevation covered by unbroken skin, caused by the extension of the tumour in the subcutaneous tissue.

From a man, aged 62, who was admitted into U. C. H., under the care of Mr. Hill, in 1883, with a carcinomatous ulcer of six months' growth on the dorsum of the fourth toe of the left foot ; the inguinal glands were also enlarged. There was no family history of cancer, and the patient thought that the disease was due to continued irritation. Mr. Hill amputated the toe and excised the gland. The wound healed, and the patient left the hospital. The growth recurred in the seat of the cicatrix with enlargement of the inguinal glands, and the patient was readmitted in 1885. Sir V. Horsley performed Syme's amputation and removed another enlarged femoral gland. The patient made a good recovery, and nine months afterwards was quite well. (Surg. Reg. Rep. 1883, p. 114, No. 9, and 1885, p. 136, No. 501.)

2441. A toe with a large squamous carcinoma. At one end of the specimen the proximal phalanx can be recognised. On one side the skin is but little altered. Along the dorsum the tumour rises considerably above the normal level of the parts. The edges overlap the healthy skin at each end. The tumour is partly covered by thin skin, but its most prominent part is ulcerating. A part of the tumour at the side of the toe has been cut away by an incision from the dorsal to the plantar surface. The structure of the tumour is soft and finely alveolar in appearance. The cut surface is oval in form, and extends to the tip of the toe, measuring 5 cm. by 3·5 cm.

Microscopic Structure.—The tumour is composed of masses of epithelium of the squamous type filling large spaces in a stroma of imperfectly developed fibrous tissue. The stroma contains large numbers of spindle-shaped and round cells, and is abundantly vascular. The epithelium in parts shows some tendency to form "nests," but this is not well marked. In parts the tissue is inflamed, and many leucocytes have penetrated amongst the epithelium-cells. It is a rapidly growing soft form of squamous carcinoma.

The specimen was obtained *post mortem* from a man who had been operated on for carcinoma of the tongue eighteen months before death. There were extensive carcinomatous deposits in the lungs and mediastinal glands. The tumour of the toe had been growing for nearly a year; it was very vascular and pulsated visibly (see No. 1486). (Godlee, Trans. Path. Soc. 1876, vol. xxvii, p. 253.)

2442. Part of an upper limb removed by amputation for a large carcinomatous ulcer. Upwards the growth reaches to slightly above the bend of the elbow, forwards to the middle of the front of the forearm, backwards to within 4 cm. of the point of the elbow, and downwards for about 6 cm. below the bend in the front of the elbow. The neighbouring skin towards the point of the elbow and the back of the arm is smooth, apparently from the cicatrix of some old injury, probably a burn. The edges of the ulcer are raised and abrupt. The outline is very irregular and the surface uneven and coarsely papillated.

The growth is a squamous carcinoma, commencing in an old scar.

2443. A piece of the skin of the dorsum of the hand, removed by operation for squamous carcinoma, together with an enlarged axillary gland. The growth in the skin is irregularly circular in outline; it measures 3 cm. in diameter; it is raised and presents at most parts a shelving edge. In two nearly circular areas, about 1·5 cm. in diameter, the surface of the growth is superficially ulcerated, the two ulcers being separated by a bridge of skin 3 mm. broad. The lymphatic gland is 3·5 cm. in length and on section presents a large fatty centre surrounded by a layer of gland-tissue which does not, to the naked eye, present any appearance of new growth. 8285

Microscopic Structure.—The growth is a squamous carcinoma. The lymphatic gland shows no evidence of secondary deposits.

From a man, aged 62, who for thirty years had worked on railway-lines and had frequently had his hands immersed in the creosote applied to the sleepers. The back of the right hand became abraided and blistered, and for five or six years a growth had been forming on it. The growth and the enlarged axillary gland were removed by operation. (Surg. Reg. Rep. 1899, p. 238.)

2444. Half a deeply ulcerated squamous carcinoma, situated in the skin of the chest above the left nipple. In the part of the tumour preserved the growth rises above the surface unequally in different places; near the nipple and for 6 cm. above it, it rises nearly 2 cm. above the level of the surrounding skin, and forms an elevated nodular mass about 3 cm. in width; at the upper part of the specimen it is much less raised; the projecting piece overlaps the neighbouring healthy skin.

The ulcerated surface is 3 cm. below the most prominent part of the tumour; it is ragged and uneven. On the cut surface the growth can be seen to be invading the fat, though its margin is clearly defined, and external to the nipple it forms a prominence beneath the skin. On the under surface of the specimen are some fibres of the pectoralis major adherent to the tumour. 5327

Microscopic Structure.—The tumour is a squamous-cell carcinoma.

From a man, aged 69, who had a congenital mole above the left nipple, which about twelve or fourteen years before admission began to enlarge. The tumour was removed on Dec. 8, 1868, and the man was discharged on Jan. 16, 1869, with the wound looking healthy.

2445. A large carcinomatous tumour of the skin beneath the jaw removed by operation. The superficial part of the tumour has been almost completely broken away from the normal integument surrounding it; it measures about 7 cm. in diameter, and projects to the extent of about 3·5 cm.; its surface is convex, nearly smooth, and appears to be covered with a thin cuticular layer, which is marked by large numbers of small openings in which the soft tumour-substance is exposed. On the deep aspect of the specimen the submaxillary salivary gland can be recognised. A section which has been made though the skin and deeper structures at the upper part of the specimen shows that these are invaded by a growth, with which the projecting part above described is continuous; the cut surface of this deep part of the growth presents an opaque coarsely granular appearance, due to the presence of closely packed yellowish-white streaks. 5725

Microscopic Structure.—The tumour has the typical structure of a squamous-cell carcinoma. Many of the masses of epithelial cells present an advanced horny change in the central part.

From a man, aged 48, who was admitted into U. C. H., under the care of Mr. Heath, Jan. 17, 1882. Eight or nine months before admission, after suffering for several days from toothache and swelling of the left side of the face, a small tumour as large as a pea was noticed below the left side of the lower jaw. The tumour slowly increased in size, until, on admission, it formed a projecting mass as large as an orange. The tumour was removed together with the submaxillary gland and other structures to which the deep part of the growth was adherent. The jaw was freely laid bare during the operation. The wound could not be closed, but was rapidly healing when the patient was discharged on March 5. It is probable that the tumour began in the skin; there was no evidence of disease in the mouth. (Mr. Heath's *Case-books*, 1882, vol. i, p. 186.)

RODENT CARCINOMA.

This form of carcinoma of the skin presents a structure which readily distinguishes it from the much more common squamous-cell carcinoma, and is usually associated with the clinical characters of the so-called "rodent ulcer." The epithelium-cells are usually arranged in large irregular masses, the individual cells being small and irregular, except those composing the peripheral layer, which are often distinctly columnar. The cells show no tendency to undergo horny involution and therefore cell-nests are absent. The growth pursues a very slow course and shows little tendency to affect the lymphatic glands. The exact origin of the growth is not certain and probably not constant, but it almost certainly originates in one of the appendages of the skin, such as the hair-follicles, sebaceous and sweat-glands, and not in the surface-epithelium itself.

Typical rodent carcinoma of the skin is most common on the face, especially on the side of the nose, close to the inner canthus. It usually begins as a wart or pimple in which ulceration slowly occurs, and the rodent ulcer thus produced continues slowly to advance both in area and depth so as ultimately to produce extensive destruction. The ulcer presents a firm slightly raised edge and a depressed almost smooth surface (2447), and as the ulcer increases in depth it may completely destroy the subjacent bone (764) and open up the nasal cavity or expose the dura mater.

Nos. 2448 and 2449 illustrate the fact that tumours having the characteristic histological structure of rodent carcinoma are not always associated with the clinical features characteristic of rodent ulcer.

2446. A rodent carcinoma of the skin, removed by operation. The growth is irregular and has a maximum diameter of 4 cm. In the lower part of the specimen the growth is raised for 12 mm. above the skin-surface and is in parts distinctly overhanging. The epithelial layer appears to be continued from the skin on to the peripheral part of the growth, but the centre is irregularly ulcerated; the floor of the ulcer shows small areas of pigmentation and a section through its base shows that pigmentation is also present in the deeper parts of the growth, which has a thickness of about 6 mm. Above the projecting part of the tumour the skin is the seat of a separate ulcer, which has the characters more usually met with in the rodent form of carcinoma; it measures 1 cm. in diameter and has an abrupt, irregular, thickened and slightly inverted edge. 8809

Microscopic Structure.—The growth has the characteristic structure of the rodent form of carcinoma of the skin. It consists of very irregular, mostly large, masses of small epithelial cells, which in many parts tend to assume an elongated and even spindle form. In some of the cell-masses deposits of yellowish-brown pigment are present in some of the cells. The epithelial growth is very abundant in the region of the hair-follicles and possibly has originated in connection with them.

There is no history to the specimen.

2447. A large rodent ulcer removed by operation from the left side of the face, a small piece of each of the eyelids being recognisable at the upper part of the specimen. The ulcer has an irregularly quadrilateral shape, measuring 7 cm. vertically by 4 cm. transversely. The floor of the ulcer is pale and beset with numerous slightly raised nodules; the border of the ulcer is sinuous, well defined, and slightly thickened. The incision by which the ulcer was removed surrounds it at a distance of about 7 mm. from its edge. On the deep aspect of the ulcer a layer of healthy fat and muscle has been removed. 8166

Microscopic Structure.—A section through the edge and adjacent part of the base of the ulcer shows a thin layer of growth having the characteristic structure of rodent carcinoma. In the thickened edge of the ulcer are many large sebaceous glands, some of which present changes suggesting that the growth had originated in them.

From a man, aged 56, who was admitted into U. C. H. in Dec. 1898, under care of Mr. Raymond Johnson. Twelve years before admission a small bluish spot was noticed in the skin over the left cheek-bone; the spot gradually ulcerated and the ulcer slowly increased in size. On admission the ulcer extended over a large part of the left cheek and left side of the nose, reaching below to the level of the angle of the mouth and above extending into the eyelids, the inner third of the upper and the inner two-thirds of the lower having been completely destroyed. The ulcer was excised and the surface covered with large grafts of epidermis. Although the orbit was not involved, the eyeball was excised on account of the necessary removal of the eyelids (Surg. Reg. Rep. 1899, p. 222, No. 2737). In Feb. 1903 the patient returned with extensive recurrence of the disease in the orbit. This was treated with X-rays, thirty-seven exposures being made between Feb. and June, when the ulcer had entirely healed. In April 1904 ulceration was again present in the cavity of the orbit and between then and October the X-rays were applied sixty-three times; the ulcer had not healed, but was considerably less extensive.

Subsequently the growth gradually extended in spite of continued X-ray treatment. In Nov. 1905, nearly 20 years after the onset of the disease, the growth formed a deep ulcerated cavity in the orbit and was spreading superficially around its margin. The patient's general health remained good and there was no glandular enlargement.

2448. A broad elliptical piece of the scalp removed by operation for a fungating carcinomatous tumour. The tumour forms a rounded nodular mass, 6 cm. in diameter, and projecting at its central part to the extent of nearly 5 cm. above the level of the surrounding skin. The margin of the growth overhangs the surrounding skin for 1·5 cm. 8101

Microscopic Structure.—The tumour has the characteristic structure of the form of carcinoma which usually assumes the clinical features of a rodent ulcer. It consists of large masses of epithelium, the cells composing which are mostly small and irregular, but in many of the masses the peripheral cells are columnar in shape. There are no cell-nests. No evidence can be obtained as to the exact starting-point of the growth.

From a woman, aged 50; ten years before her admission into U. C. H. a wart had been removed from the forehead. The growth rapidly recurred and increased and for seven or eight years it had been ulcerated. The growth preserved in the specimen was situated in the middle line of the front of the hairy scalp, with which it moved freely. There was no glandular enlargement. The tumour was successfully removed. (Surg. Reg. Rep. 1898, p. 118, No. 2124.)

The specimen is a striking example of a tumour having the clinical features of a fungating squamous carcinoma, but the histological structure of the form of carcinoma usually associated with rodent ulcer.

2449. An elliptical piece of skin removed by operation for a rodent carcinoma, in section. The growth, which has an irregularly elliptical outline, measures 4·5 cm. by 2·5 cm. The growth forms a nearly flat surface raised to the extent of about 3 mm. above the level of the surrounding skin; its edge is well-defined and in most parts slightly everted, but in one situation it shelves gradually to the level of the surrounding skin. The surface of the growth appears to be ulcerated, except at the extreme border on to which the epithelium of the skin seems to be continued. The section shows that the base of the ulcer is formed by a layer of growth 6 mm. in thickness, inseparably connected at its deep aspect with the subcutaneous fat. A few faint streaks of pigment can be seen in the growth with the naked eye. 6641

Microscopic Structure.—A section through the growth shows numerous separate epithelial masses lying in a cellular stroma; the central cells of the masses are spheroidal, but the peripheral layer columnar; there are no cell-nests. There are small collections of yellowish-brown pigment in the epithelial masses and in the stroma. The cell-masses appear to be sections of branching columns continuous with the deeper layers of the surface epithelium and probably originating in connection with hair-follicles. Although with the naked eye the growth appears to be ulcerated, a thin horny layer is in most parts traceable over its surface.

The growth was situated on the shoulder.

DISEASES OF THE SEBACEOUS GLANDS.

Sebaceous or Atheromatous Cysts.

A sebaceous cyst is formed by the gradual distension of a sebaceous gland with its own secretion after obstruction or obliteration of the duct. At the same time that the cavity of the gland is being distended by the accumulating secretion the cyst-wall is formed by an overgrowth of the vascular fibrous tissue forming the walls of the acini. The dilated acini coalesce, forming a single cavity, sometimes imperfectly subdivided by septa projecting from the cyst-wall. The wall is composed when fully developed of layers of dense fibrous tissue containing few vessels; it is lined by a large cubical epithelium. The contents are composed of a fluid or semi-solid substance resembling porridge, which under the microscope is found to consist of epithelium-cells undergoing fatty degeneration, free fat-granules, and usually numerous crystals of cholesterine. Externally the cyst-wall is separated from the surrounding fat by a layer of very delicate areolar tissue.

It is believed that some of the cysts classed as sebaceous cysts are developed independently of the sebaceous glands and are more nearly allied to the dermoids.

Sebaceous cysts are most common on the scalp. They are also commonly met with on the back, neck, and face, and occasionally elsewhere. Those growing on the hairy scalp are distinguished by the thickness of their walls; their contents are often dry and laminated (2450). Those growing elsewhere have thinner walls and more fluid contents. On the face and back a small black spot can sometimes be seen in the skin covering the cyst, indicating the situation of the obliterated duct (2451).

Sebaceous cysts are subject to the following changes:—

a. The cyst may become inflamed and suppurate.

b. The skin lying over a large sebaceous cyst may become adherent and ulcerate (2452). The contents of the cyst may then be discharged and from its interior a large amount of exuberant granulation-tissue protrude, giving rise to an appearance suggestive of a malignant growth. This change is most common in the scalp.

c. The sebaceous material may slowly escape from an orifice in the skin and after drying form a prominence of horny consistence (sebaceous horn, 2458).
d. The cyst-wall and its contents may calcify (2456, 2457).
e. In rare cases a squamous-cell carcinoma may arise from a sebaceous cyst after ulceration.

2450. Three sebaceous cysts from the scalp. The upper cyst, which is the largest, measures about 2·5 cm. in diameter; it is globular in form, but flattened on the side that has been turned towards the skull. An incision has been made into it on the opposite side. The middle specimen has been laid open to show its structure and contents. The wall is thick and fibrous in structure. The contents are arranged in concentric layers composed of dense sebaceous material. In the centre is a cavity from which the contents have fallen out.

In the lowest specimen the contents have been completely removed. The cyst-wall is slightly thicker than in the larger cysts.

The outer surface of all the specimens is smooth, and has evidently been perfectly free from adhesions to the surrounding parts.

2451. A sebaceous cyst with the skin covering it, removed from the dead body. The skin is thin and has a few long hairs upon it, and probably belongs to the face or front of the neck. The cyst is of a flattened globular form and measures about 3 cm. in its transverse diameter. It has been loosely connected with the surrounding parts by areolar tissue, and its surface is smooth. Where it touches the skin it is adherent over an area of about 1 cm. The skin at this part is smoother than natural, but otherwise healthy. A small black spot can be seen near the centre of the adherent skin, which is probably the orifice of the duct leading to the gland from which the cyst has developed.

2452. A large sebaceous cyst removed from the buttock. It consists of two parts of unequal size, the larger oval in form and measuring 7 cm. in its longest diameter, the smaller globular and measuring 3·5 cm. in diameter. Part of the cyst-wall has been cut away, and two small holes have been made into it in dissecting it out. A small oval piece of skin has been removed with the cyst, and is adherent to it; it is smooth on the surface, and perforated by a round opening 8 mm. in diameter, apparently the result of ulceration. The outer surface of the cyst-wall is smooth and has not been adherent to the surrounding parts except where it touches the skin. The lining of the cyst is wrinkled. In the smaller part is a layer having the appearance of desquamating epithelium. 6134

The cyst contained "atheromatous matter." It was removed from the buttock of an adult by Mr. Godlee.

2453. Half a large sebaceous cyst with the skin covering it. The cyst-wall is readily separable from the surrounding tissues. The cyst measures on the cut surface 5 cm. by 3·5 cm. The sebaceous matter filling the cyst has, in large part, become laminated and exceedingly hard so as somewhat to resemble horn in appearance.

2454. A large sebaceous cyst with some of the surrounding skin, removed from the back. An incision has been carried through the cyst. It is irregularly globular in form, and measures 4 cm. in diameter. It forms a tumour projecting about 3·5 cm. above the level of the skin and is slightly constricted at its base. It is covered by skin of considerable thickness, wrinkled and free from ulceration. On one side the skin has been partly separated from the cyst-wall to show the absence of adhesions between them. The cyst-wall is thin; externally it is smooth; internally it is for the most part wrinkled, but free from roughness. From the superficial part of the cyst-wall a solid growth projects into the cavity; it is very hard and opaque white in parts. 3578

The tumour was removed by Mr. Liston from the back of a man aged 50. The parts of the cyst now empty were filled by the ordinary atheromatous matter. The solid mass projecting from the cyst-wall is hard and gritty, and calcification has taken place in it.

Microscopic Structure.—The wall of the cyst is composed of dense fibrous tissue containing numerous large vessels. It is lined internally by epithelium closely resembling that of the thin skin covering the cyst. The outgrowth is composed of a similar vascular fibrous tissue springing from that forming the cyst-wall as numerous processes, and carrying with it epithelium in the form of columns communicating one with another. There are areas of calcification in the fibrous tissue; but there is no true ossification, nor can calcification of epithelium-cells be found.

2455. A sebaceous cyst of the neck, in section. The cyst is globular and measures 5 cm. in diameter; it has a thin fibrous wall and smooth inner surface, the thick porridge-like contents having been removed. The superficial part of the cyst is intimately connected with the skin covering it. 7649

From a man, aged 56. The cyst had been growing for twenty years; it was situated over the anterior border of the sternomastoid. (Surg. Reg. Rep. 1896, p. 90, No. 1970.)

2456. Half a small disk-shaped tumour measuring 3 cm. in diameter, removed from the skin of the back. The tumour is finely nodular on the surface and seems to have been encapsuled so as to be removed cleanly from the surrounding tissues. The cut surface is granular, with an indistinct tendency to lamination near the surface. 6113

Microscopic examination shows it to be a sebaceous cyst, the contents of which have undergone calcification.

The tumour was removed from the back of a young woman by Mr. Marshall. It lay near the angle of the scapula. It was of almost bony hardness.

2457. A calcified sebaceous cyst removed from the scalp. The specimen consists of a large irregularly disk-shaped mass of calcareous matter, 5·5 cm. in its longest diameter and 2·5 cm. in thickness. The deep surface is nearly smooth, slightly concave and covered in part by a layer of fibrous tissue, evidently an adherent portion of the epicranial aponeurosis. The superficial surface is convex and irregularly lobulated. 9058

From a man in whom a hard movable tumour of the scalp had existed for 6 years.

2458. A sebaceous horn from the scalp. It is 6 cm. in length and sharply curved. 7348

From an old woman. The horny growth gradually formed in the position of a "small boil," which discharged. The "boil" was probably an inflamed sebaceous cyst.

DISEASES OF THE SWEAT GLANDS.

Hypertrophy.

Hypertrophy of the sweat-glands is a rare disease; it consists of an overgrowth of the glands with a thickening of the connective tissue between them.

2459. A piece of skin with the subcutaneous tissue beneath it. In the skin is a flat oval growth measuring 2·5 cm. by nearly 2 cm.; it rises abruptly from the surrounding skin for about 3 mm. The neighbouring skin is normal. The elevated growth is covered with finely wrinkled skin, in which a few round openings like the orifices of enlarged sweat-glands can be seen with a lens. A few fine hairs are scattered over the surface of the growth. In the subcutaneous tissue is a flattened oval tumour measuring 3 cm. in length, 2·5 cm. in breadth, and 8 mm. in thickness, which has caused the elevation just described; it extends in the subcutaneous fat beyond the limits of the elevation on the surface of the skin. The tumour is not circumscribed, but is evidently invading the surrounding fat.

It is composed of small oval lobes, placed with their long diameters at right angles to the surface of the skin.

Microscopic Structure.—A section of the tumour shows that it is formed by an overgrowth of the sweat-glands. The whole mass is composed of convoluted tubes lined with epithelium, mostly resembling exactly the normal sweat-glands in appearance. In some parts they are of wider diameter than the normal glands. The tubes are everywhere mixed up with the subcutaneous fat, the unaltered fat-cells lying in the midst of the bundles of tubes. There is no small-celled infiltration in the adipose or areolar tissue in contact with the new glandular tissue, so that it would seem that the growth is not malignant, but merely a "hypertrophy of the sudiparous glands," as it is termed by Rindfleisch.

From the appearance of the skin it has probably been removed from the cheek.

DISEASES OF THE NAILS.

The only abnormal condition of the nails illustrated in the Museum is simple overgrowth of the great toe-nail. In this condition the nail loses its flat form and develops into a rough, tuberculated, round growth, more resembling a horn.

2460. A great toe-nail of twenty years' growth, from an old woman. It measures about 7 cm. in length. It is irregularly cylindrical in form, and bent in a single long curve. Its surface is wrinkled and brown in colour. 6162

2461. The extremity of a great toe, the nail of which forms a curved, brown, horn-like growth, about 9 cm. in length. The under surface of the nail is deeply concave. 7446

GANGRENE OF THE EXTREMITIES.

The specimens included in this series are mostly wax models of gangrenous limbs.

Although no sharp line of distinction can be drawn between them, the two forms of gangrene, dry gangrene and moist gangrene, are well exemplified in gangrene of the limbs.

In *dry gangrene* the skin becomes first of a dead white colour, but after a short time a mottled white and purplish tint is common; subsequently the part becomes dry, shrivelled, and black (2463).

In *moist gangrene* the part becomes swollen and of a dark purple colour; blebs, often of considerable size, containing a blood-stained serous fluid, form beneath the cuticle, and the latter may separate over large areas (2462). Ultimately the dead parts become black, and on account of the moist condition of the dead tissues, putrefaction readily occurs in them.

Dry gangrene is seen in its most typical form in that which results from a gradual arrest of the circulation in a part caused by chronic arterial disease. Except in these circumstances, the gangrene is almost always of the moist variety, and is always so when it results from inflammation or strangulation. In all forms of gangrene, if the process becomes arrested, the changes concerned in the separation of the dead part commence in the living tissues which are in contact with the dead. A narrow zone of ulceration (*line of demarcation*) forms around the gangrenous area and gradually extends from the skin to the deeper structures. As the line of ulceration deepens, it also becomes wider, partly by the retraction of the living tissues and partly by further shrinking of the gangrenous part (2464). The surface of the living tissues from which the dead have separated is covered with a layer of granulation tissue. As the gangrenous process usually extends higher in the superficial than in the deeper tissues, the stump left by the separation of the gangrenous extremity of a limb is conical in shape, and the bone protrudes bare from the end (2467). If left to nature, the dead bone will at last separate, and a thin cicatrix may cover the whole end of the stump.

The most common cause of spontaneous gangrene of the extremities, especially the lower, is chronic arterial disease, of which the most important forms are chronic endarteritis and calcification of the middle coat (2469). Examples of the diseased vessels from gangrenous limbs are preserved in Nos. 1161, 1163, 1183. The determining cause of the gangrene is the thrombosis consequent on the disease of the vessel-wall. Sometimes, as in Nos. 1186, 1189, and 1191, the exact cause of the thrombosis is less evident. Syphilitic arterial disease is an occasional cause of gangrene of the extremities, and in many cases of diabetic gangrene arterial disease appears to be the most important factor (1185). In gangrene due to embolism, the arrest of the circulation is in part due to the thrombosis occasioned by the lodging of the embolus in the artery (2466).

Among the many ways in which gangrene of a limb may result directly from injury, the following are the most important:—Direct damage to the tissues, as by crushing: strangulation, as by tight bandaging (2462); injury to the main vessels; and the effects of heat and cold.

Gangrene may also result from various forms of inflammation of a part, especially such as occasionally follows the more severe forms of wound-infection.

2462. A wax model of the upper limb of a child, illustrating gangrene from tight bandaging. The fingers and hand are greatly swollen. The tips of the fingers are of a dusky purple colour. On the back of the fingers and hand are some large blebs, white in colour. The forearm is less swollen, but shows here and there the marks of the bandage. The swelling in this region has been prevented by the compression of the bandage. In the bend of the elbow is a deep depression, and above this is another shallower mark. This is the point at which the compression was greatest. 4351

The accident has evidently arisen from bandaging the limb with the elbow in the extended position and afterwards flexing it.

2463. A wax model of a right foot, in which gangrene of the anterior half has resulted, probably from arterial disease. The gangrenous parts are dry, black, and shrivelled. The line between the dead and living skin is sharply defined, but no separation has commenced. The line is very irregular, extending on the outer side to near the malleolus, and on the inner side to only 3 cm. beyond the head of the first metatarsal bone. The living skin immediately adjoining the line of demarcation is of a dusky red colour.

2464. A wax model representing gangrene of the anterior parts of both feet, probably resulting from arterial disease. There is a wide line of demarcation between the living and dead tissues, and the separation of the gangrenous parts is far advanced. In the right foot the gangrene only implicates the toes. These are black, dry, and shrivelled. On the dorsum of the foot between the dead and living skin is an ulcerating surface nearly 2 cm. in width; it is covered by a smooth pale layer of granulations in great part concealed by a layer of pus; some of the extensor tendons are seen in the line of separation. In the left foot the whole sole is gangrenous as far as the heel; on the dorsum the skin is dead to the middle of the foot. Between the healthy skin and the black mummified toes is a space 4 cm. wide; in the lower part of this the skin is wanting, and the tendons covered by unhealthy granulations are visible. 4862

2465. A wax model of a right foot and the lower part of the leg in which gangrene has occurred, probably from arterial disease. The whole dorsum of the foot, as high as the instep, is in a state of dry gangrene; in the sole the gangrene extends only as far as the middle of the foot. On the outer side of the leg the gangrene has extended upwards for 17 cm. in a broad irregular strip, continuous below with the dead skin on the dorsum and outer side of the foot. All the gangrenous parts are black, dry, and shrivelled, but no line of demarcation has formed. 4863

2466. A wax model of the right foot of a girl suffering from gangrene following embolism. The gangrenous parts are dry and slightly shrivelled, and for the most part purplish black in colour. The edge of the blackened tissues extends to the heel on the inner side, and then passes obliquely upwards over the inner malleolus to a point 7 cm. above the lower end of the outer malleolus. The line is irregular and sinuous. The dark-coloured gangrenous part ends abruptly. Immediately beyond it is a dead-white zone of skin, about 1 cm. in width, and beyond this again is a narrow zone of hyperæmia. The white part was probably dead, and would in time have become black.

From a girl, aged 15, who was admitted under the care of Mr. Marshall into U. C. H., February 1, 1868. She had rheumatic fever one year before admission. A month before admission she had a fit that left her paralysed on the left side, but she recovered enough to be able to walk. On January 24 she felt a dull, heavy, cold sensation of pain in the right foot and leg, which became perfectly white. It was somewhat relieved by hot bottles. There was no sudden pain. On admission she looked ill, pulse 120, temp. 100°, tongue furred. There was great pain in the right calf. Below the union of the lower and middle thirds of the leg, the limb presented all the signs of gangrene. The toes were all of a bluish-black colour, cold, clammy, and totally devoid of sensation. These characters were marked on the dorsum as high as midway between the web of the toes and the anterior part of the ankle, extending a little farther on the outer than on the inner side. Above this, as high as the junction of the middle and lower thirds of the leg, the skin was mottled, cold, clammy, and almost devoid of sensation. The sensation at this part ceased very abruptly, and above it, in the upper and middle thirds of the leg, the skin was acutely sensitive. The femoral and popliteal arteries could be felt pulsating distinctly, but there was no pulse in the tibials. The symptoms increased, and on March 31 Mr. Marshall amputated about 4 inches below the knee. Very little hæmorrhage occurred, only two vessels being tied, the peroneal and a muscular branch. The muscles, except the gastrocnemius, were in a state of fatty degeneration. The patient went on well, as far as the operation was concerned, but died on April 30 of heart disease. No *post mortem* examination was made.

2467. A wax model of the lower part of a right leg after spontaneous separation of a gangrenous foot. The limb has been amputated by a circular incision. Below the amputation-wound is a ring of healthy skin about 2·5 cm. long. Beyond this is a granulating surface about 6 cm. in length. The edge shelves gradually down from the skin to the granulating surface, and a thin layer of new epithelium extends for some distance over the granulations. From the end of this circular ulcerating surface the bones project bare and dry, both being exposed at the sides as far as the bases of the malleoli. No tendons or other structures can be recognised in the granulating zone. 5374

The specimen illustrates the mode of separation of part of a limb after gangrene. The stump left is always more or less conical. The skin separates higher than the other soft parts, and the gap is increased by shrinking of the living skin from its elasticity. The muscles also retract, but to a less extent than the skin, and the bones are left bare and protruding from the end of the stump.

The patient was a woman aged 40. She was admitted into U. C. H. in May 1870. Both feet had separated, leaving stumps such as are shown in the model. Amputation was performed on both sides, and the patient died five weeks later from pyæmia. A month before admission she ran away from the Hendon Workhouse, got drunk, and slept under a hedge. On waking in the morning she had lost the use of both feet, which ultimately became gangrenous and sloughed off.

2468. A left hand with the lower part of the forearm, removed by amputation for gangrene, probably resulting from embolism of the brachial artery. The gangrene involves all the digits, which are black and slightly shrunken. The gangrene extends higher on the palmar than on the dorsal aspect, reaching above the middle of the palm, but posteriorly not extending beyond the fingers. The limit of the gangrene is in parts, especially in front and on the outer side of the hand, marked by a distinct line of demarcation. Beyond the limit of the gangrene the cuticle is separating from the hand, and on the dorsal surface are two ulcers; the larger of these, 6 cm. in length, is on the middle of the hand, and the smaller is immediately above this on the back of the wrist. The amputation has been performed by a long anterior and a short posterior skin-flap; the divided tissues look healthy. 8957

From a woman aged 76, who was under the care of Mr. Godlee in 1902. She had been subject to a skin disease which occurred in acute attacks, and was followed by copious and almost universal desquamation, with loss of hair. The attacks were preceded by a rise of temperature. In the intervals between the attacks the hair grew again. The gangrene of the hand came on acutely, and was preceded by a sharp pain in the arm. The radial and ulnar pulses could not be felt, and the brachial pulse was very feeble. A faint systolic, probably aortic, murmur was audible.

2469. A left foot, together with the bones and main arteries of the leg, from a limb removed for gangrene of the toes and adjacent part of the foot. The four outer toes are black and shrunken; the great toe has separated at the metatarso-phalangeal joint, the extremity of the metatarsal bone being left exposed and discoloured. The gangrene has extended to about the middle of the foot on both the dorsal and plantar aspects. The limit of the gangrene is, in many parts, especially on the dorsum, marked by a well-defined line of demarcation, the dead parts having shrunken and retracted from the living skin around. On the outer side of the foot the limit of the gangrene is ill-defined. The part of the foot beyond the limit of the gangrene is slightly swollen, and the discoloured cuticle is desquamating.

The three arteries of the leg are almost uniformly converted into rigid calcareous tubes, the calcification having probably originated in the middle coat. The section of the popliteal artery shows that the lumen of the vessel is much narrowed by the swelling resulting from chronic endarteritis, and in one part of the section is seen a yellow calcareous deposit in the wall of the vessel. 9631

The specimen illustrates gangrene of the foot resulting from chronic arterial disease. The tibial and peroneal arteries are the seat of extensive primary calcification of the middle coat, and the popliteal artery is the seat of chronic endarteritis with secondary calcification.

From a man, aged 70, who was admitted into U. C. H. under the care of Mr. Raymond Johnson, July 29, 1904. He had enjoyed good health and worked all his life on a farm. The gangrenous process started in the great toe soon after Christmas 1903. On admission the patient's general condition was good; the urine was normal; both radial arteries were very rigid, and calcareous rings could be distinctly felt in them. On Aug. 3 amputation was performed above the condyles of the femur; short antero-posterior skin-flaps were raised and the muscle divided circularly and retracted. The patient left the hospital on August 26. (Mr. Godlee's *Case-books*, 1904, Orchard.)

AMPUTATION STUMPS.

Nos. 2470 to 2475 illustrate the shape of the stump left by some of the various methods of performing amputation at different positions in the upper and lower limbs.

The open end of the medullary canal in the bone in an amputation stump becomes plugged by a mass of granulation-tissue in which ossification occurs, so that the end of the bone becomes eventually smooth and rounded; the whole bone often becomes porous and somewhat atrophied (2477–2479). If septic infection occurs after an amputation, the extension of the suppuration into the medullary canal may be followed by a more or less extensive necrosis (425–430).

The muscles in an amputation stump, except those engaged in moving it, undergo more or less complete atrophy, and divided tendons after retracting form new attachments to the bones on which they act (2476).

The main vessels usually remain patent to near the cicatrix, but become diminished in calibre in proportion to the amount of the limb which has been removed.

A bulbous condition of the nerves in an amputation stump may be regarded as normal (1125 to 1128), but in some cases of painful stump the bulbous condition appears to be excessive, or the pain may be the result of the extremity of a nerve being involved in the cicatrix, especially if the latter is adherent to the bone (2481).

Conical stump may result from the provision of an insufficient covering to the bone, and was formerly a common result of retraction of the soft parts from the bone in the process of healing (2485, 2486). In amputations performed upon children, especially in the arm, the stump may gradually assume a conical form as the result of continued growth of the bone (2482, 2483).

2470. A plaster cast of a stump after amputation in the middle of the forearm. The limb has been amputated by long antero-posterior flaps of equal length. The covering is abundant and lax, and the scar lies immediately to the palmar aspect of the bones.

2471. A plaster cast of a stump after amputation in the middle of the thigh by antero-posterior flaps. The flaps have been equal or nearly so in length, and the scar, which is healthy and almost linear, lies directly over the end of the bone. The covering is lax and abundant. Near one end of the cicatrix is the scar of a counter-opening.

2472. A plaster cast of the stump resulting from amputation through the knee-joint by Stephen Smith's method. The outline of the lower end of the femur, loosely covered by skin, is obvious, and the patella forms a prominence on the anterior aspect of the stump. The scar has been drawn upwards on to the back of the thigh. 6884

2473. A plaster cast of a stump after amputation at the "seat of election," a hand's breadth below the knee. The joint is flexed to show the way in which the patient would bear his weight upon the knee in walking with an artificial limb. The limb has been amputated by a long posterior flap from the calf. This has retracted in healing so that the scar is over the ends of the bones. The cicatrix is irregular, and healing has evidently taken place by the second intention.

2474. A stump resulting from amputation through the lower part of the leg by Guyon's method. The rounded extremity of the stump is formed by the heel-flap, the cicatrix passing transversely around the anterior aspect. 7444

The first amputation was performed for sarcoma of the foot. Recurrence followed in the leg and poplitcal space, and reamputation was performed through the lower part of the thigh.

2475. A plaster cast of a stump after Pirogoff's amputation at the ankle. The pointed shape of the stump shows that a piece of the os calcis has been saved in the flap. The stump after Syme's amputation is flatter.

2476. A stump after a medio-tarsal (Chopart's) amputation, dissected to show the new attachments formed by the divided tendons. The head of the astragalus and the anterior articular surface of the os calcis are covered in by a thick layer of dense cicatricial fibrous tissue. All the tendons that have been divided are lost in this tissue and are inseparably connected with it. Close to the internal malleolus, between it and the tendon of the tibialis anticus, the cicatricial tissue has been cleared away to show the situation of the head of the astragalus. The cartilage covering the head has disappeared and is replaced by fibrous tissue continuous with that of the cicatrix. The tendons have thus a firm connection with the head of the astragalus and the anterior extremity of the os calcis.

2477. Half the lower 3·5 cm. of the humerus after amputation of the arm. The compact tissue is unaltered, and the saw-marks are quite fresh. The medullary canal is filled by a soft mass of granulation-tissue, replacing the fat and projecting from the lower end.

2478. The upper part of the femur from a stump after amputation through the thigh, in section. The surface of the compact tissue has been rendered unnaturally porous by dilatation of the vascular canals, and at its lower extremity it is roughened by a deposit of new bone. The sawn extremity is rounded and very open in texture.

It is probable that the considerable extent of the inflammatory changes which have occurred in the bone were due to suppuration in the wound following the operation.

2479. The lower ends of the tibia and fibula, from an old stump after amputation in the middle of the leg. The ends of the bones are rounded towards the superficial aspect. The medullary canal is closed by a layer of compact bone. A strong bridge of bone passes between the lower ends of the two bones; at its middle is a slight constriction, apparently marking the place at which the outgrowths from the two bones met and coalesced. Near the attachment of the bridge to each bone are some irregular bony outgrowths, spongy on the surface. The surface of the bones is less smooth than natural, and marked by longitudinal furrows for vessels, showing that the periosteum has been inflamed for some distance above the point at which the bones were divided. 3320

2480. Part of the scar and the parts above it from a stump after amputation of the thigh, with the sciatic nerve adherent to it. There seems to have been a deep furrow across the scar. One of the hamstring muscles lies close to the nerve; its divided end is in close contact with the surface of the scar in the furrow and is lost in the cicatricial tissue; above this its fibres are healthy. The end of the nerve is also adherent to the scar; it is not bulbous, but is slightly rounded at the end.

2481. A stump after amputation in the middle of the arm, dissected to show the bulbous state of the ends of the divided nerves. The cicatrix in the skin has been cut away, but the deep part adherent to and covering in the end of the bone has been left. The median, ulnar, and internal cutaneous nerves are slightly bulbous at their extremities and are firmly connected with the deep part of the cicatrix. On the musculo-spiral is a bulbous swelling 2 cm. in length and 1 cm. in diameter, the lower end of which is involved in the scar. The fibres of the muscles that have been cut through in preparing the specimen appear healthy. 3377

The patient was a man, aged 53. He underwent amputation of the thumb in consequence of an injury. Amputation was afterwards performed in the middle of the forearm in consequence of secondary hæmorrhage and cellulitis of the hand. After the cicatrisation of the wound the patient complained of great pain in the stump and in the situation where the tourniquet had been applied. Amputation of the arm was then performed, but the stump was not good. Amputation was again performed nearer the shoulder, and the patient was relieved of many of his symptoms.

2482. A stump after amputation through the middle of the arm, in vertical section. The osseous tissue of the humerus is considerably atrophied, the compact tissue, especially at the lower extremity, being very thin. The epiphysial cartilage of the upper extremity is still present. The end of the stump is conical and composed only of the end of the bone covered by the cicatrix, beneath which the medullary canal is closed by a thin layer of compact bone.

2483. A plaster cast of an extremely conical stump, left after amputation in the middle of the arm. The scar is irregular and wrinkled longitudinally. The bone projects from the middle of it for about 4 cm., covered by a thin adherent cicatrix (see No. 2484).

2484. The lower end of the humerus 3·5 cm. in length, removed from the stump from which the cast preserved in the last specimen was taken. The lower 2 cm. are covered by a thin layer of cicatricial tissue. The end of the bone is rounded and the medullary canal is closed by a very thin plate of bone.

The patient was a girl, aged about 13. The arm was amputated up country in the Cape by an amateur. The patient afterwards came to England and was admitted into U. C. H. under the care of Mr. Heath. The piece of bone was removed; a circular incision being made around it, and the soft parts stripped off for another inch before sawing. An excellent stump resulted.

2485. The lower end of the femur, 4·5 cm. in length, removed from a conical stump. The bone is much atrophied, the compact tissue being very thin and spongy. The medullary canal is closed by a mass of soft spongy bone. The lower end is very soft and spongy, and above it is a ring of osteophytic outgrowths, especially towards the posterior and inner side of the bone. 2935

The patient was a boy aged 17. He had undergone amputation at the lower part of the thigh by the circular method. The stump was scarcely ever healed; it became very conical and was a source of great inconvenience. Several years after, the portion of bone above described was removed so as to form a better stump.

2486. The upper third of the leg, removed through the knee-joint for a conical stump left after amputation at the junction of the upper and middle thirds of the leg. The limb has been removed by a short anterior and a long posterior flap cut by transfixion. The soft parts have retracted from the bones, leaving the tibia exposed for 7 cm. in front. The fibula projects for 2·5 cm. beyond the tibia, and is uncovered for about half that distance. The wound has healed, except where the two bones protrude, a narrow line of granulation alone remaining in contact with the bone. Beyond this is a thin, smooth cicatrix covering the greater part of the end of the stump. The protruding bones are completely bare of periosteum and are dirty yellow in colour. A deep groove is to be noticed in contact with the granulation-tissue, showing that the dead parts of the bone were commencing to separate.

CONGENITAL MALFORMATIONS.

Malformations of the Face and Mouth.

Single Hare-lip.—This consists in the presence of a notch or cleft in the upper lip on one side of the middle line, more commonly the left than the right. The hare-lip is said to be complete or incomplete according as the cleft does or does not extend into the corresponding nostril; when complete the orifice of the nostril is flattened and the ala nasi stretches across the upper end of the cleft (2487). Single hare-lip is frequently accompanied by the presence of a notch in the corresponding part of the alveolar process, or may be complicated by cleft palate. The cleft in a single hare-lip corresponds in position with the fissure between the central part of the lip or prolabium and the lateral part which develops from the maxillary process.

Double Hare-lip.—In some instances a complete or incomplete hare-lip is present on each side of the prolabium (2487). Much more commonly double hare-lip is associated with a complete cleft of the palate, in which case the prolabium, usually imperfectly developed, together with the premaxillary bone, is displaced more or less forwards, and remains connected with the septum nasi and the tip of the nose.

Median Hare-lip.—A median cleft in the upper lip is very rare and corresponds with the line of union of the two globular processes of the median nasal processes which form the philtrum. It may be associated with the presence of a median notch in the alveolar process.

Median cleft of the Lower Lip has occasionally been met with, sometimes extending to the jaw.

Clefts of the Cheek are rare. In the oblique form a cleft extends from the upper lip into and sometimes beyond the orbit, and may involve the bones as well as the soft parts. In the transverse form the aperture of the mouth is extended on one or both sides a varying distance into the cheek (*macrostoma*).

Cleft Palate.—This may be limited to the soft palate or may extend any distance forwards in the middle line as far as the situation of the anterior palatine canal. It is due to want of union of those parts of the roof of the mouth which are formed by the maxillary processes. If the cleft extends in front of the anterior palatine canal it no longer remains in the middle line, but either deviates to one side of the middle line and passes through the alveolar process opposite a single hare-lip or bifurcates, so that, if associated with double hare-lip, the premaxillary bone, with the prolabium, is separated from the rest of the alveolar process. The position of the cleft in the alveolar border varies somewhat in its relation to the teeth; it usually extends between the central and lateral incisors, so that in cases of double hare-lip and complete cleft palate the separated premaxilla usually contains only the two central incisor teeth (2488–2490).

Dermoid Cysts may occur on the face in positions corresponding with the lines of union of the various processes from which the face is developed. The most common situation is at the outer angle of the orbit. The wall of a dermoid cyst more or less resembles skin in structure, with papillæ and often some of the appendages, such as sebaceous glands, hair-follicles, and sweat-glands. The contents are usually composed of sebaceous matter in which hairs are often present. The dermoid cyst which is met with at the outer angle of the orbit usually lies under the orbicularis palpebrarum close on the bone, which is often indented or may even be perforated, so that the cyst is in contact with the dura mater.

2487. The face of an infant with double hare-lip and cleft palate. On the right side the cleft in the lip is complete and is continuous with a wide cleft in the palate; the nostril is thus much flattened and the ala nasi is drawn across the cleft. On the left side the hare-lip is incomplete and forms only a notch at the free margin of the lip, which does not extend into the nostril. The premaxillary bone is united with the left alveolar border and projects considerably in front of the right alveolar border; anteriorly it is covered by the prolabium attached above to the columna nasi. The cleft in the palate did not extend through the whole length of the soft palate. 5430

2488. The bones of the face of an infant with cleft palate, macerated. The premaxillary bone is attached to the right superior maxilla, and the cleft extends forwards through the alveolar border on the left side. The line of union of the premaxilla with the right superior maxilla can be seen on the palate surface. In the premaxilla are apparently the right and left central and the right lateral incisors. The cleft passes between the left lateral and central incisors; the former having been exposed by dissecting away the wall of its sac. The septum nasi is fully developed, and is attached to the palate process of the right side; but the vomer at its lower end expands into a flat plate of bone which to a certain extent takes a share in the formation of the hard palate. The nasal process of the superior maxilla on the left side is flatter than that on the right, causing a want of symmetry between the openings of the right and left anterior nares. 5871

2489. The premaxilla from a case of cleft palate. During maceration the bone has separated in the middle line, and each half contains an incisor tooth.

The bone was probably removed during the operation on the hare-lip, which also existed.

2490. Three premaxillæ removed from cases of cleft palate. Each of the lower two contains two incisor teeth; the upper one contained all the four incisor teeth, of which, however, the right lateral is now wanting.

2491. The lower part of the superior maxillary bones of an adult affected with cleft palate. The cleft in the palate extends forward into the anterior palatine canal, and posteriorly has a width of nearly 2 cm. The alveolar borders are well formed and symmetrical, but the left lateral incisor tooth has not developed.

Before removal of the soft parts the cleft extended from the middle of the hard palate backwards to the uvula.

2492. Part of the bones of the face of an adult, showing a cleft of the hard palate. The alveolar process is normal and the teeth appear also to have been normal. There is a central cleft in the hard palate which at its posterior end measures 2·2 cm. in width; it gradually narrows as it extends forwards to the position of the anterior palatine foramen. The vomer is imperfectly developed in its lower part; it occupies its natural mesial position, so that the nasal cavities are symmetrical. 8398

In the recent state the cleft extended back through the whole length of the soft palate, but the front of the cleft in the hard palate for a distance of about 2 cm. was closed by a membrane continuous with the margins of the bony cleft and covered by the mucous membrane of the nose and palate.

2493. The bones of the face and a great part of the sphenoid, with some of the soft parts covering them, from an adult with cleft palate. The specimen is injected and has been partly dissected. All the teeth are wanting, except the second molar on each side. The cleft in the palate extends from the uvula to the anterior palatine canal; it is about 8 mm. in width at its widest part. The septum nasi is very imperfectly developed. On the right side a great part of the soft palate has been cut away, and the soft parts have been dissected from the posterior part of the hard palate, to show the posterior palatine foramen with the artery passing through it. The levator and tensor muscles of the palate have been dissected on each side.

CEPHALOCELE.

A cephalocele is a tumour formed by a protrusion of some part of the contents of the cranium through an opening in its bony wall. Cephalocele is most common in the posterior part of the skull, and the opening is usually situated in the middle line below the occipital protuberance (2495). When situated anteriorly the tumour is most common at the root of the nose; the sac communicates with the interior of the skull between the ethmoid and frontal bones, and in a very rare variety of this form of cephalocele the tumour has been found projecting into the nasal cavity. Cephalocele is very rarely met with in the vertex, and still more rarely at the base of the skull or in the orbit.

The tumour formed by a cephalocele is usually pedunculated; the tumour is covered with normal or modified skin, immediately beneath which are the membranes.

A cephalocele is often translucent; it may pulsate synchronously with the heart-beat and with the respiration; it is sometimes partly reducible.

The following varieties of cephalocele are recognised:—

1. *Encephalocele.*—This, the commonest form, contains a protrusion of the cerebrum or cerebellum (2496).

2. *Meningocele.*—This consists of a sac formed by protrusion of the membranes, containing fluid only (2494).
3. *Hydrencephalocele.*—In this rare form the protruded brain-substance, which may be reduced to a very thin layer, surrounds a cavity containing fluid and communicating with one of the ventricles.
4. *Meningo-encephalocele.*—In this very rare form the protrusion of brain-substance is separated from the membranes by a collection of fluid (2495).

Cephaloceles are not uncommonly associated with modifications of the shape of the skull, and hydrocephalus is common; malformations may also be present in other parts of the body.

2494. A cranial meningocele with the skin covering it, removed by operation. It has been attached by a pedicle about 2 cm. in diameter, which has been cut through in the operation. The pedicle is composed of the skin of the scalp with a small amount of hair; beneath this is the fat, and in the centre is a small area, apparently composed of fine fibrous tissue. The cyst in its present state measures about 6 cm. in diameter. The skin-covering is thin and free from hair. Beneath it is a layer of loose areolar tissue containing some fat near the pedicle. The cyst itself is composed of a tough fibrous membrane, smooth internally. It can be readily separated from the tissues covering it except at the pedicle, where it is attached by a narrow band beneath which a piece of glass has been passed. 122

The cyst was removed by Mr. Soley, of Windsor, from the head of a child. He had punctured the tumour some days before, and it filled again. The sac had no communication with the interior of the skull. The child recovered. It is evidently a meningocele, the pedicle of which has been extremely narrow and has undergone spontaneous obliteration. The part of the head to which it was attached is not stated; spontaneous cure is most common at the anterior fontanelle.

2495. A large occipital meningo-encephalocele, together with the part of the occipital bone through which the tumour protrudes, and part of the occipital lobes and cerebellum. The protrusion forms a nearly globular sac, 40 cm. in circumference. The part of the tumour near the pedicle is covered with thick skin, bearing hair, but over the most prominent part the skin is thin and inseparably united with the fibrous cyst-wall. The inner surface of the sac is in most parts covered with a delicate, easily separable, reticular membrane, very rich in blood-vessels. A rounded protrusion of the cerebellum, 2 cm. in diameter, projects into the attached part of the sac. The pedicle measures 5 cm. in diameter. The opening in the occipital bone through which the membranes protrude is situated in the middle line below the occipital protuberance, and appears to have a diameter of less than 1 cm.; a protrusion of the cerebellum can be seen to enter the opening. 7606

From a male infant who died at the age of 15 weeks. When the child was admitted into U. C. H. at the age of 4 weeks the tumour, which projected from the back of the head, measured 16 inches in circumference; it was pendulous and translucent, and the skin covering it was ulcerated over an area 2 inches in diameter; some fluid was drawn off with a needle. During the first month the tumour increased 2 inches in diameter, after which the head became hydrocephalic and the tumour slightly diminished in size. For twenty-four hours before death leakage occurred from the ulcerated surface. (Surg. Reg. Rep. 1896, p. 96.)

2496. The left half of the head of a still-born female child, showing a large occipital encephalocele. The cranium is small and the encephalocele forms a rounded slightly pendulous tumour in the occipital region, having a vertical diameter of 8 cm. and projecting backwards to the extent of 5 cm. The tumour is marked off from the rest of the head by a sulcus, and the lower pendulous portion is in contact with the back of the neck. The tumour is covered with skin, which over the proximal part of the tumour bears hair; on the most prominent part the skin is thin and bluish, and on the postero-inferior aspect is depressed and presents an irregular cicatricial appearance. On the surface of the section it is seen that the opening through which the brain protrudes involves the whole vertical extent of the occipital bone, extending into the foramen magnum and having a vertical diameter of 4·5 cm. The part of the brain which protrudes includes the posterior part of the cerebrum and the whole of the cerebellum. The protruding brain is closely surrounded by a fibrous sac continuous with the dura mater and separated from the skin covering the tumour by a layer of blood-clot, 1 cm. in thickness (see No. 2497). 8968

2497. The opposite half of the same specimen, the brain having been removed. The margin of the opening through which the cephalocele projects extends below to the spinal canal, and in the rest of its extent is formed by the tentorium. The dura mater can be traced continuously from the cavities of the cranium and spinal canal over the edge of the opening into the wall of the sac. 8968

2498. The right half of the posterior segment of the base of a skull with the corresponding part of the cerebellum and tentorium. There is a pedunculated meningocele measuring 5·5 cm. long and 4·5 cm. broad. It communicates with the interior of the skull by a narrow opening just behind the posterior margin of the foramen magnum. The skin covering the sac is for the most part healthy, but at the lower part and on the right side shows signs of superficial ulceration. Part of the wall has been removed; it is about 5 mm. thick. The interior is lined with a smooth but slightly corrugated membrane, and on tracing this up through the neck of the cyst it is found to be continuous with the dura mater. The part of the cerebellum shown in the specimen is hollowed out into a cavity measuring 3·5 cm. from before back, and about 1·5 cm. from above down. The neck of the sac is occupied by a mass of solid tissue continuous with the substance of the cerebellum.

The tissue forming the wall of the sac, on microscopic examination, presents evidences of inflammation, but no brain-substance can be detected in it.

Dermoid Cysts of the Scalp.

Dermoid cysts, when present in the scalp, are deeply placed and lie in contact with the bone or the membrane of one of the fontanelles. The bone beneath the cyst is often the seat of a depression or, as the result of imperfect development, may even present a perforation, so that the cyst is connected with the dura mater.

Dermoid cysts have been met with in connection with the mastoid process and, in very rare instances, on the inner surface of the skull.

2499. A plaster cast of a left ear, behind which is a swelling caused by a dermoid cyst of the scalp. The tumour is elongated, and lies with its long axis nearly horizontal; it measures 5·5 cm. from before back, 3·5 cm. from above down, and projects to the extent of nearly 2 cm. in its most prominent part. The anterior extremity of the tumour nearly reaches to the attachment of the pinna and is overlapped by the helix. 6678

From a man, aged 22, who was under the care of Mr. Heath in U. C. H. in 1890. Six years previously he had been kicked on the head by a horse; six months later a swelling appeared behind the left ear in the position of the kick and steadily increased in size. The tumour presented the appearances shown in the cast; the skin covering it was normal, and around the tumour, which fluctuated distinctly, a distinct bony edge could be felt. The cyst was dissected out; it lay on the bone and at one spot was firmly adherent it. The cyst contained sebaceous matter with many hairs, one of which measured 7 inches in length; the cyst was lined with a layer of stratified epithelium. (Surg. Reg. Rep. 1890, p. 22.)

Congenital Cysts and Fistulæ of the Neck.

Congenital cysts and fistulæ of the neck may be lateral or median in position; the lateral ones probably arise from the second branchial cleft, and the median ones from the thyroglossal tract. The external opening of a lateral branchial fistula varies much in position, but is most common at the anterior border of the lower part of the sternomastoid; the opening is usually minute and exudes a small quantity of mucus; the internal opening, when present, communicates with the pharynx in the neighbourhood of the tonsil, and the tract passes between the internal and external carotid arteries and above the glossopharyngeal nerve (2502).

A branchial or dermoid cyst developed from the second branchial cleft is usually situated below and behind the angle of the jaw, beneath the sternomastoid and in contact with the sheath of the vessels (2500, 2501). The cyst may contain clear serous fluid or thick sebaceous matter mixed with hairs.

Median cervical fistulæ may open at any level below the hyoid bone; the external opening is not usually present at birth, but results from rupture of a cyst originating in the lower part of the thyroglossal tract. The sinus extends upwards on the deep aspect of or even through the hyoid bone, and may even extend as far as the base of the tongue.

Cysts originating in the lingual portion of the thyroglossal tract are preserved among "Diseases of the Tongue."

2500. A branchial dermoid cyst removed by operation. It is somewhat ovoidal in shape, and measures 5·5 cm. in its longest diameter. 6619

Microscopic Structure.—There is a thin fibrous wall lined by a stratified epithelium, the deepest cells of which are columnar. The contents formed a creamy fluid containing epithelial scales, cholesterin crystals, and granular debris. There were no hairs.

From a man, aged 41, who was in U. C. H., under the care of Mr. Barker, in 1891. A swelling was first noticed below the angle of the jaw on the right side of the neck twenty months before admission; it formed a soft fluctuating tumour reaching upwards to between the mastoid process and the ramus of the jaw and downwards to the level of the pomum Adami. The cyst was overlapped posteriorly by the sternomastoid, and its anterior border lay beneath the mylohyoid; the facial artery and vein crossed it superficially. (Surg. Reg. Rep. 1891, p. 200.)

2501. A branchial dermoid cyst removed by operation. The cyst, which is thin-walled, measures 6 cm. in diameter; the inner surface is smooth, and the inner epithelial layer can be readily separated from the outer fibrous layer. 8698

Microscopic Structure.—The wall of the cyst is lined by stratified epithelium. It contained a thick fluid, like pus.

From a woman, aged 24, who was in U. C. H. in 1901, under the care of Mr. Bucknall. The swelling in the neck had been noticed for six years. The cyst was on the left side of the neck immediately below the parotid gland, and lay beneath the sternomastoid in contact with the jugular vein. (Surg. Reg. Rep. 1901, p. 104.)

2502. A complete branchial fistula removed by operation. The tube measures 3·5 cm. in length; the upper end, which has been closed by a thread, indicates the internal opening; beyond this for more than half its length the tube is dilated into a cyst. Inferiorly is the minute external opening of the fistula on the surface of the skin. 8914

From a boy, aged 5 years. The minute external opening was situated over the right sternomastoid on a level with the middle of the thyroid cartilage. In removing the fistula it was traced round the anterior border of the sternomastoid where it passed deeply beneath the external carotid artery at the level of the hyoid bone. It was ligatured and divided close to the wall of the pharynx. (Mr. Godlee's *Case-books*, 1902, vol. iii, p. 510.)

2503. A dermoid cyst, opened and the contents removed. The cyst is thin-walled and measures 3 cm. in diameter. 9178

From the middle line of the neck above the hyoid bone. The cyst contained sebaceous matter and numerous fine hairs.

2504. A small dermoid cyst filled with sebaceous matter. 9591

From a boy, aged 5 years, in whom a swelling in the middle line of the neck just above the hyoid bone had been noticed for two years. The cyst lay beneath the mylohyoid and extended deeply between the genio-hyoglossi muscles.

2505. A cyst which in the recent state contained air and was removed by operation from the neck. The cyst is thin-walled, ovoidal in shape, and 2·8 cm. in its longest diameter. 9831

Microscopic Structure.—The cyst wall is lined with three or four layers of small spheroidal epithelial cells.

From a man, in whom a swelling in the middle line of the neck had been present for several years. The cyst lay over the thyro-hyoid membrane, but had no communication with the air-passage.

TERATOMA OF THE NECK.

This term is applied, as in the case of certain tumours in other parts of the body, to tumours of mixed structure occasionally met with in the neck and regarded by some pathologists as fœtal inclusions.

2506. A plaster cast of the head and shoulders of an infant. A large oval tumour, three times the size of the head, is attached to the left side of the neck by a wide base reaching from the ear to the clavicle. Its upper border partly conceals the ear, extends along the line of the zygoma to the angle of the left eye, then downwards past the angle of the mouth and chin to the front of the neck, where it extends a little to the right of the middle line. Posteriorly, the border nearly corresponds to the line of the anterior border of the trapezius and inferiorly to the clavicle. The tumour hangs down over the left shoulder, as low as the middle of the arm. At its most prominent part it projects 15 cm. from the middle line of the neck, the diameter of the head being 9·5 cm. The surface is very faintly lobulated. 5949

2507. Half the head and neck of a fœtus, of apparently the 7th month, with a large congenital tumour. The head and the tumour have been divided by a vertical incision in the middle line. The tumour measures about 9 cm. from above downwards, and the same from before backwards. Anteriorly, the skin of the neck from immediately below the chin is stretched over the surface of the tumour, and inseparably blended with it. Above, the tumour is in close contact with the root of the tongue and the hyoid bone. The larynx, trachea, and œsophagus are stretched over the posterior aspect of the growth, and form a groove in it. The cervical spine seems to have been curved by the tumour. The greater part of the tumour is solid, but scattered through it everywhere are numerous cysts. The smallest of these cysts merely give a sponge-like appearance to the mass, but some reach a much greater size and have very distinct fibrous walls. The cavities of these larger cysts are partly filled by growths proceeding from the surrounding solid tissue, and similar in structure. A dissection of the left side of the neck below the jaw has been made, showing the upper limits of the tumour in that direction. The submaxillary gland is shown to be healthy, and the tumour has no attachments in that direction. 5677

Microscopic Structure.—The tumour has a delicate connective-tissue stroma, in which are seen the sections of columns of hyaline cartilage, the peripheral cells of which are in some places indistinctly marked off from the stroma in which they lie. A few tubules lined with a layer of cubical or columnar epithelium are also present, as well as large irregular masses of small round cells.

CERVICAL RIBS.

A supernumerary rib attached to the seventh cervical vertebra is occasionally met with on one or both sides of the spine, and its presence is due to the excessive development of a rudiment normally represented in the fœtus by a separate centre of ossification in the anterior bar of the transverse process. The rib varies in length; its anterior extremity may be free or it may be connected with the first thoracic rib or its cartilage, or may even articulate with the sternum. When well developed the rib may form an obvious tumour in the supraclavicular region. When the supernumerary rib is more than 5 cm. in length the subclavian artery generally passes over it, and the unusual prominence of the vessel above the clavicle may draw attention to the malformation. In rare instances the artery has become dilated or thrombosed. Symptoms more often result from the pressure of the cervical rib upon the brachial plexus.

2508. A cervical rib removed by operation from the right side. The rib measures 5·5 cm. in length, and in shape much resembles a normal first rib, being flattened from above down and the tubercle being situated at the angle. The head of the rib is small and has a cartilaginous surface. The distal extremity of the rib is somewhat enlarged, and has an irregular line of articulation with a bony projection, which has been removed with it and which is the extremity of the enlarged scalene tubercle of the first thoracic rib. 9479

From a female, aged 19, who was under the care of Sir Victor Horsley in 1904. The symptoms were stiffness of the neck and pain down the right arm. The rib could be felt, but did not cause any visible fulness.

SPINA BIFIDA.

Spina Bifida is a congenital malformation in which the bony structures naturally closing in the spinal canal have failed to unite in the middle line. Through the cleft thus remaining unclosed, the contents of the canal usually protrude to form a tumour of the back. In extremely rare cases the tumour has protruded anteriorly into the thorax or abdomen. In the ordinary spina bifida it is the neural arches which are imperfectly developed, and the tumour protudes beneath the skin of the back. The malformation may affect one vertebra only, but most commonly several consecutive vertebræ are involved. In about 90 per cent. of the cases the lumbar vertebræ are affected, most commonly with the upper part of the sacrum, rarely with some of the dorsal vertebræ or alone. The remaining 10 per cent. include those in which the cervical, dorsal, or sacral vertebræ are affected.

The following forms of spina bifida, differing in their anatomical characters, are recognised:—

1. *Myelocele.*—This form of spina bifida is usually met with in still-born fœtuses and appears to result from the arrest, at an early stage, of the development of the spinal cord. The central canal of the cord opens upon the surface of the back in a groove bounded laterally by a raised mass of vascular nerve-tissue continuous at its margins with the skin. The defect may involve the whole spinal column and may be associated with anencephaly.
2. *Meningo-myelocele.*—This is the most common form of spina bifida and is usually met with in the lumbo-sacral region. It consists of a sac formed by the protruding membranes, with the posterior part of which the lower end of the cord and the nerves arising from it are connected. The tumour is usually rounded in form and sessile (2509); the skin covering the base of the tumour is normal, but over the central part it is often thin and scar-like (2510) and may become superficially ulcerated (2512). In the middle line of the tumour

a depression or furrow often indicates the position of the spinal cord within (2511). The tumour is often translucent and becomes tense during respiratory efforts. Dissection shows that the cord, after entering the upper part of the sac, becomes intimately connected with the posterior wall, appearing merely as a thickened band from which the spinal nerves arise and cross the interior of the sac to reach the intervertebral foramina (2510). The cerebro-spinal fluid in the sac occupies the subarachnoid space.

3. *Meningocele.*—In this form of spina bifida, which is much more rare than the last, the tumour consists merely of a sac formed by the spinal membranes and containing cerebro-spinal fluid; the opening in the spinal canal is often small. The tumour formed by a meningocele is usually more pedunculated than that of a meningo-myelocele and the skin covering it may be normal throughout (2520). It is a matter of considerable practical importance that a small spinal meningocele may be masked by an overlying mass of fat having the clinical features of an ordinary lipoma.
4. *Syringo-myelocele.*—In this very rare form the central canal of the spinal cord is dilated in that part of the cord which occupies the sac, and the nerve-tissue is spread out into a thin layer in contact with the membranes (2521), Instead of crossing the interior of the sac as in a meningo-myelocele, the nerves are embedded in its wall and can only be demonstrated by careful dissection between the layer of nerve-tissue and the membranes. There are no distinctive clinical features of this form of spina bifida.
5. *Spina bifida occulta.*—In this form, which is also very rare, the defect in the arches of the vertebræ, usually in the lumbo-sacral region, is unaccompanied by any protrusion of the contents of the spinal canal (2524). There may thus be no external sign of the malformation, but in some instances a considerable growth of hair is present in the skin over the bony defect and even in the neighbouring parts (2527).

Spina bifida is often accompanied by other evidences of defective development, such as hydrocephalus, club-foot (2577), and various forms of muscular paralysis and defective sensation in the lower limbs. It is not uncommonly associated with malformations of other parts of the body. The recognition of spina bifida occulta has several times resulted from evidences of disturbed innervation in the lower limbs, especially perforating ulcer of the foot.

2509. A wax model of the lower part of the back and the buttocks of an infant suffering from spina bifida. The tumour is situated over the sacrum and the lower lumbar vertebræ. It is irregularly hemispherical and very faintly lobulated on the surface. It is sessile, and its base measures about 6 cm. in diameter. The skin covering it is smooth and dusky in colour, but otherwise healthy. Near the most prominent part it has a bluish tint (the artist probably intended to represent it as almost translucent at this point). 2554

2510. The lower four lumbar vertebræ, with the sacrum and coccyx, from a child, with spina bifida. A vertical incision has been carried through the specimen and the left half has been macerated. The neural arches of the last two lumbar vertebræ and of the sacrum are incomplete. The tumour is sessile and corresponds to the whole of the part in which the arches of the vertebræ are open. The sac measures 4·5 cm. from above downwards at its base. Its base is covered by healthy skin, but at the most prominent part it becomes thin and scar-like in appearance. At this point it is translucent, and the various coverings are inseparably blended together. The spinal cord leaves the canal opposite the last lumbar vertebra, crosses the sac, and is adherent to it by its terminal extremity just below the thin translucent part before mentioned. The nerves of the cauda equina cross the sac from the cord to the sacral foramina. The anterior part of the dura mater lies in close contact with the vertebræ; the posterior can be seen protruding backwards and forming the lining of the sac. The arachnoid goes with the dura mater and cannot be recognised. The pia mater cannot be recognised, but has probably followed the cord. 6079

The specimen is a meningo-myelocele.

2511. A vertical section of the lower five dorsal and the lumbar vertebræ, with the sacrum and coccyx and the sac and coverings of a spina bifida, from an infant. The neural arches are deficient from the third lumbar downwards. The sac of the spina bifida measures about 4 cm. in length. The skin covering it is puckered, and looks for the most part normal, but towards the centre it is traversed by a longitudinal depression opposite the line of origin of the nerves, and in this part the skin is more glistening and thinner than normal, and closely resembles a scar. The smooth dura mater lies internal to the skin, and probably blended with this is the arachnoid, although this cannot be made out in the specimen. The lower end of the cord passes abruptly to the top of the sac, forming a distinct bend backwards and upwards, like the end of the letter J. The nerves can be seen traversing the sac, arising from the summit of it. A deep transverse depression in the skin indicates the spot at which the cord reaches the summit of the sac-wall. 6175

The specimen is a meningo-myelocele.

2512. Half of the lower four lumbar vertebræ and the sacrum with the sac and coverings of a spina bifida, from an infant. The neural arches of the two last lumbar vertebræ and of the sacrum are imperfect. Through the opening thus left, the membranes protrude, forming a sac measuring about 2 cm. from before backwards, and 3·5 cm. from above downwards. Below, the sac reaches nearly to the coccyx; above, it overlaps the neural arches of the second and third lumbar vertebræ. The sac is covered by the integument; at the most prominent part the fat has disappeared, and the skin is much thinned and inseparably blended with the protruded membranes; at this point it is ulcerating superficially over an area about 2·5 cm. in diameter. The lower end of the spinal cord is protruded backwards into the sac, and is adherent to it above the middle; from this point the nerves forming the sacral plexus pass forwards to their foramina, crossing the sac. The nerves have been dissected after they leave the foramina. 5709

The specimen is a meningo-myelocele.

2513. The last four lumbar vertebræ and the sacrum, from an infant the subject of spina bifida. The specimen has been divided by a vertical incision carried through the middle line. In the right half the vertebræ have been cleaned, and the spinal cord and nerves removed. The neural arches are imperfect from the fourth lumbar downwards, and the membranes are protruded, forming a slightly protruding sac, measuring 3 cm. from above downwards, and 2 cm. from before backwards. The skin covering the sac is wrinkled and scar-like, and inseparably blended with the membranes over an area 2 cm. in diameter; in the centre it is superficially ulcerated. The lower end of the spinal cord leaves the canal and is adherent to the sac towards its upper part. The nerves then cross the sac to reach their foramina. 6078

The specimen is a meningo-myelocele.

2514. A vertical section of the lower two lumbar vertebræ with the sacrum and coccyx; extending from the upper border of the second sacral vertebra downwards is the sac of a spina bifida. The summit of the sac is on a level with the surrounding soft parts; the skin at the margin is comparatively healthy, but the greater part is converted into a brown slough. The cord and its membranes are distinctly traceable into the sac; the former has been injected.

The cord seems to terminate abruptly in the brown slough mentioned, but the nerves are seen arising from the posterior wall of the sac in its whole length, and traversing the cavity of the sac to pass through the intervertebral foramina.

The nerves of the sacral plexus have been dissected out as they leave the foramina. At the upper and lower parts of the sac there is a slight space between the dura mater and the surrounding soft parts.

The specimen is a meningo-myelocele.

2515. A vertical section of the last two lumbar vertebræ with the sacrum and coccyx from a child, the subject of spina bifida. An oval piece of skin has been preserved corresponding to the vertebræ; in the centre of this is an oval slightly elevated area in which the skin is wrinkled and puckered, and presents a vertical scar-like depression at its centre on the surface. Beneath the skin is a dense mass of cicatricial fibrous tissue, which extends forwards into the open spinal canal, but is separated from the posterior surface of the vertebral bodies by a layer of fat. The cauda equina and the lower end of the cord are lost in the mass, which completely fills the spinal canal as far as it is shown. The arch of the fourth lumbar vertebra can be seen in section, apparently properly developed. 6198

From a case treated by injection of Morton's iodo-glycerine solution, and apparently cured. There is no history as to the cause of death.

The specimen is a meningo-myelocele.

2516. A vertical section of part of a spinal column, including the lower two dorsal with the lumbar vertebræ and the sacrum and coccyx, showing a partially cured spina bifida of the lumbo-sacral region. The spina bifida measures in its longest diameter 7 cm. and the sac is for the most part obliterated by tough fibrous tissue. The posterior layer of the dura mater, when it reaches the cleft, turns abruptly backwards and can be traced some distance on the surface of the fibrous tissue filling the sac; its anterior part and the cord are only traceable a very short distance. Below the obliterated part of the sac is a cavity 2·5 cm. long; its interior is smooth, but traversed by several rounded cords, probably the nerves. There are also one or two similar but smaller spaces in the substance of the tumour, the largest being at the summit, opposite the entry of the cord. The skin at the base of the sac is normal in appearance and covered with long fine hairs; at the summit the epithelium is smoother and more glistening and scar-like.

The softening in the centre of the cord is probably post-mortem. 6186

Dissection of the opposite half of the specimen showed that the laminæ had failed to unite from the third lumbar vertebra downwards, and above the cavity displayed in the section was another smaller cavity traversed by some of the nerves.

The specimen is a meningo-myelocele.

The specimen was from a child under the care of Mr. Godlee in the North-Eastern Hospital for Children. It had been treated by injection with Morton's fluid.

2517. The right half of a spinal column with the corresponding ribs and hip-bone showing a spina bifida commencing at the 11th dorsal vertebra. "The bodies of the vertebræ along the whole column are serially and numerically correct, but those, from the 5th to the 9th inclusive, of the dorsal vertebræ are small, some smaller than others, and placed behind these, in close contact with them and dwarfing them, is a second, or supplementary set of bodies or apparent bodies. These are separated from one another and from the bodies in front of them by lines (apparently) of intervertebral substance. Furthermore, at the back of these are three smaller osseous pieces, also resembling vertebral bodies, which are produced into processes projecting into the vertebral canal, and the halves of the bisected spinal cord pass on the sides of these processes" (Journ. of Anat. and Phys. vol. xx, part iv, July 1886, p. 589).

The sac of the spina bifida consisted of a central and two lateral portions, the arrangement in the left half having been almost exactly similar to that shown in the right half. In the specimen the lateral and central portions communicated by an opening, about 6 mm. in diameter, above the spinal cord as it emerges from the vertebral canal, and by two or three small openings in the lower part of the partition. The lateral space is completely subdivided into an upper and lower portion, the lower being again subdivided into non-communicating cavities. In the highest lateral division there are two or three nerve-roots forming pairs, with which are roots lying on the inner aspect of the septum, which therefore corresponds in position with the ligamentum denticulatum The nerve-roots pass from their origin along the posterior and lateral walls straight forwards to the intervertebral foramina. The spinal cord is traceable into the highest part of the sac; for about 10 mm. it is free, but beyond this it becomes incorporated with the sac-wall. At its entrance to the sac the cord was bifid, owing to the presence of the process of bone already mentioned (Clin. Soc. Trans. vol. xviii, p. 369, No. 201). (See No. 2518.)

2518. The left half of the spinal column from the preceding specimen, macerated in order to show the abnormal arrangement of the vertebræ mentioned in the above description.

2519. The neural arches of the lower lumbar vertebræ with the sacrum, from a case of spina bifida. The tumour is of large size, measuring 9 cm. in diameter, and the sac is attached by a narrow pedicle and is covered by thick skin, except at the most prominent point, where it is a scar-like area 2·5 cm. in diameter; over the upper part of the tumour the skin is coarsely warty and pigmented and close to the right edge of the scar-like area there is a nipple-like prominence. An opening which has been made into the left side of the sac shows that the interior is subdivided by two broad folds arising from its inner surface. The opening in the vertebral arches involves the three lower lumbar vertebræ, the imperfect development being more marked on the left than the right side. Through this opening the sac communicates with the spinal canal by a tube of dura mater through which a piece of glass rod has been passed. The nerves of the cauda equina are attached to the opening and apparently form loops passing a short way into the neck of the sac. 4128

The specimen is a meningo-myelocele.

From a woman, aged 32, who died in U. C. H. of bronchitis and hydrothorax, under the care of Dr. Walshe. She had borne several children. The fluid in the larger sacs was of a pale straw-colour and contained a small quantity of albumen. A few oil-globules, but no cells or crystals were found in it.

2520. A small spinal meningocele removed by operation, in section. The tumour, after shrinking, measures 2·5 cm. vertically and its pedicle measures 13 mm. in diameter; the surface is covered with wrinkled skin. The section shows a central cavity. 7 mm. in diameter, which communicated by a small opening with the spinal canal. 9691

The specimen is a meningocele.

The meningocele was successfully removed by operation from a child 5 weeks old. It was situated in the middle line in the lower lumbar region, and formed a slightly pedunculated tumour 1 inch in diameter.

2521. The lower part of the spinal column of a child suffering from spina bifida in the sacral region. The skin surrounding the sac has been preserved, and the sac has been laid open; it measures about 14 mm. in diameter. The arches of the dorsal and lumbar vertebræ have been cut away to show the cord. The interior of the sac is lined with a soft pulpy substance, and no spinal nerves pass into it. Superficial to the pulpy layer is a well-defined fibrous sac formed by the membranes of the cord (on dissecting the specimen some spinal nerves were found in contact with the sac and adherent to it, but these are not recognisable in the bottle). A bristle has been passed from the sac through its neck. This is seen again in the upper part of the specimen lying in the dilated central canal of the spinal cord, which has been opened by a longitudinal incision opposite the lower dorsal vertebræ. 6176

The specimen is a syringo-myelocele.

From a child, about 2 months old, who was admitted into U. C. H. under the care of Mr. Beck. The sac was thin and threatened to give way. It was twice injected with Morton's iodo-glycerine solution. The injection was followed by complete paralysis of the lower limbs. There were no convulsions. After the operation there was greatly increased tension of the fontanelle and symptoms of hydrocephalus began to develop. The child died of exhaustion about two months after the first injection. (Clin. Soc. Trans. vol. xviii, p. 366, No. 8.)

2522. A vertical section of a spinal column from the fifth dorsal vertebra downwards. The lumbar curve is exaggerated, and the compensating dorsal curve is apparently wanting. There is the sac of a cured spina bifida involving the sacral region, extending from the first sacral vertebra downwards.

The tumour measures 5 cm. vertically. The skin at its base is normal, but at its summit it is deeply puckered, especially at the upper part opposite the entrance of the cord, where it is thin and scar-like.

The spinal cord is distended and hollowed out in the centre, presenting transverse folds, somewhat resembling the valvulæ conniventes of the small intestine. The membranes are traceable for some distance into the sac, where they become lost in the dense fibrous tissue filling it. The spinal cord passes out of the canal into the upper part of the sac and can be distinctly differentiated from the dense connective tissue by which it is surrounded.

The specimen is a syringo-myelocele. One of the feet from the same case, showing talipes calcaneus, is preserved in No. 2577.

2523. The lower part of the spinal column and part of the pelvis of an infant with spina bifida; the kidneys are also preserved. The soft parts have been removed from the spine in order to display the opening resulting from want of closure of the arches of the last dorsal and all the lumbar and sacral vertebræ. The elongated gap thus produced measures 9 cm. in length and is 3·5 cm. in width at its broadest part in the lumbar region. In the lumbar region the separated laminæ are everted. The kidney is horseshoe-shaped; the right half measures 5 cm. in length by 3 cm. in breadth; the left half is converted into an oval cyst, measuring 4·5 cm. by 2·5 cm. and joining the lower part of the right half of the organ on the front of the spine. The left half of the kidney extends down to the sacral promontory. The left suprarenal capsule is normal. The right ureter is normally placed and crosses in front of the kidney; the left ureter is attached to the lower end of the cystic left half of the kidney. Both ureters are pervious, and each opened into the bladder. The renal vessels are normal.

From a child, aged 11 days, who was admitted into U. C. H. with spina bifida. There was complete paralysis of the lower limbs. Death occurred from purulent meningitis extending throughout the whole length of the spinal canal. The skin covering the tumour was extensively destroyed by ulceration, exposing the spinal cord, which was soft and sloughy. (Surg. Reg. Rep. 1889, p. 22, No. 2030.)

2524. A sacrum and coccyx, together with the skin and soft parts covering their posterior surfaces: the latter have been divided vertically and partly dissected in order to display a spina bifida occulta. The sacrum, the right ala of which has been removed, presents marked asymmetry and imperfect development. In front the bone presents a diminution of the natural curve, but there is a well-marked lateral curvature, the concavity of which is directed to the left; the coccyx continues the lateral curve, its apex being directed considerably to the left. The four anterior sacral foramina are present on each side of the bone, the distance between the upper two on the left side being, however, only 5 mm. and the bone internal to them presenting a deep depression. Only three of the four ridges normally present on the anterior surface of the bone can be recognised, the segment between the upper and middle ridges probably representing the second and third sacral bodies. The upper surface of the first sacral vertebra is small and directed much to the left, and a slightly raised bony surface, which has been divided at its centre, is situated on the upper surface of the left ala; it is thus probable that the last lumbar vertebra was united with the sacrum in this situation. Posteriorly, the wall of the sacral canal is wanting in its whole extent, leaving a gap which at its upper extremity measures 2·5 cm. transversely. Entering the upper end of the sacral canal is seen the spinal cord surrounded by the membranes. The soft parts, including the skin covering the posterior surface of the sacrum, have been preserved and divided by a vertical median section. In its deepest part the incision has divided the cord, which is flattened and adherent to the thinned dura mater and overlying soft parts. On the deep aspect of the sacral canal and connected with the left side of the spinal cord are several transverse bands looking like nerve-roots. Between the skin and the cord is a layer of dense fibro-fatty tissue, 2 cm. in thickness. The skin over the middle of the sacrum is wrinkled and in parts scar-like; to the left of the middle line there is a nipple-like projection covered with numerous long hairs. The skin over the coccyx is the seat of an irregular ulcer measuring 4 cm. by 2 cm.; in its peripheral parts the ulcer is superficial, but in the central part it extends more deeply and the tissues in its base are sloughy. 8520

The specimen is a spina bifida occulta. There is no history to the specimen beyond the statement that it was obtained "from a female, who died of pelvic disease."

2525. Part of a sacrum, together with a narrow strip of the skin which covers its lower extremity. Below the level of the second spinous process the posterior wall of the sacral canal is wanting, so that a triangular gap results, measuring 2·5 cm. transversely at its lower extremity. In the skin over the lower extremity of the gap above mentioned is a depressed opening 8 mm. in diameter; on the right side the opening is bounded by a projecting edge continuous above with an overhanging fold of skin, from which and the skin below it numerous long hairs project. From this opening a glass rod has been passed into the spinal cord and appears again at a higher level, occupying the dilated central canal. At a distance of 2 cm. below the opening in the skin above described is a deep depression in the integument situated slightly above the lower extremity of the sacrum. 6498

The specimen is a spina bifida occulta. There is no history to the specimen.

2526. The sacrum from a case of spina bifida. The bone is unusually long, as the result of the presence of a sixth segment, and it presents a slight lateral curvature having the concavity directed to the right. The last two segments of the coccyx are bent backwards at a right angle with the rest of the bone. Each of the sacral spines is represented by two processes, placed one on each side of the middle line and separated to the extent of 1 cm. to 1·5 cm. In some of the spines there is considerable difference in size between the two parts, and the left portions of the third and fourth spines are fixed together. Between the level of the second spines and the lower border of the third the sacral canal is closed by a plate of bone continuous with the laminæ, but above and below this the canal is open. The theca and nerves of the cauda equina are normal. (See No. 2527.) 9790

The specimen is a spina bifida occulta.

2527. A piece of the skin of the lumbo-sacral region, from the same case as the preceding specimen. The skin is the seat of an abundant growth of dark hair over an area measuring 19 cm. from above down and 10 cm. from side to side. Some of the hair measures 14 cm. in length. 9790

From a man, aged 51, who was admitted into the Colney Hatch Asylum Feb. 1, 1898, suffering from advanced dementia. The right foot had been amputated thirteen years previously for disease beginning in the great toe and gradually extending to the sole. Death occurred on Feb. 20.

Dermoid Cysts of the Trunk.

Dermoid cysts have been met with in various parts of the middle line of the trunk, as, for instance, over the lower part of the spine, on the scrotum (2168) and penis, at the umbilicus, and over the sternum (2528). Parts of a dermoid cyst from the interior of the chest are preserved in Nos. 1870 and 1870 A.

2528. A large oval dermoid cyst, 8 cm. in its longest diameter, together with the skin which covered its most prominent part. The wall of the cyst is thin; the inner surface has the appearance of skin and some of the sebaceous matter with which the cyst was filled is adherent to it. 7198

The cyst was removed by Mr. Godlee from over the ensiform cartilage of a boy aged 15. The cyst was slightly pedunculated.

Congenital Sacro-coccygeal Tumour.

The tumours to which this name is given are situated on the anterior aspect of the coccyx and sacrum, and may reach a large size (2529, 2531). They consist of cysts and tubules lined with columnar epithelium, lying in a richly cellular stroma containing areas of hyaline cartilage (2532). Their exact origin is uncertain; according to one view they originate from the postanal gut.

2529. A wax model of the lower half of a male eight months' fœtus, with a large congenital sacral tumour. The tumour is attached to the lower part of the nates. Laterally it reaches to just behind the trochanters and in the middle line in front to immediately behind the anus. In the position in which the body is placed, the thighs rest on the front of the tumour, and the legs hang down over its rounded lower surface, being in contact with it nearly as far as the heels. The tumour measures about 19 cm. transversely at its widest part. It is slightly lobulated and covered by healthy skin. (See No. 2530.) 3555

2530. The pelvis and pelvic viscera, together with a large tumour attached to the coccyx, from the case from which the wax model preserved in the preceding specimen was prepared. The pelvis and its viscera are normal. The tumour is attached to the coccyx, chiefly on its anterior surface, by a firm fibrous pedicle. The tumour after being dissected measures 17 cm. in length and 9 cm. in breadth; it consists of numerous lobules of solid tissue, apparently composed largely of fat and of several cysts, the largest of which has been opened at the upper part of the tumour; in one part of the tumour is a hard mass which appears to contain bone. 3569

The tumour was elastic and fluctuating, but there were hard projections; the skin was adherent at the most prominent parts. The rectum was so much displaced by the traction of the tumour that the anus was situated on the anterior surface of the tumour about an inch below the scrotum. In the recent state the cysts in the tumour were filled, some with bloody serum others with a yellow fluid like pus; some of the larger cysts were partly filled with a solid friable substance projecting from the wall. The condition of the specimen renders microscopic examination impossible.

2531. The left half of the pelvis and the corresponding lower limb of a male infant, together with half a large congenital sacral tumour. The section has not been carried exactly in the middle line, so that the anus is not shown in the specimen. The tumour is oval in form, and measures 14 cm. by 11 cm. It is covered by skin, which at the lower part has become thinned and adherent, and at one part is sloughing. The tumour springs from the region of the sacrum and its upper extremity occupies the lower parts of the pelvis in front of the sacrum.

The scrotum is of normal form, and situated in front of and above the tumour. The lower limb is flexed in front of the tumour, and does not reach quite to its lower part. The tumour is distinctly circumscribed, and enclosed in a capsule of fibrous tissue. Its substance is divided into lobes by bands of fibrous tissue; between these the texture is like that of a sponge; it is composed of a stroma, presenting no structure to the naked eye, in which are innumerable small cysts, mostly globular in form. A few large cysts of irregular form, apparently formed by the fusion of some of the smaller cysts, are present. Some of the cysts contain solid intracystic growths, but the greater number are empty, having been filled in the fresh state with a clear fluid, in some cysts thin, in others gelatinous. (See No. 2532.) 5501

2532. A slice from the tumour preserved in the last specimen. 5501

Microscopic Structure.—"The tumour is composed of regular and involuted cysts and duct-like spaces, lined for the most part with cubical epithelium, and held together by young, richly cellular connective tissue. In many situations the epithelium is columnar, set upon flatter cubical cells. In a few spots flattened trabeculæ, or branching plates of hyaline cartilage, occur in the intercystic partitions, and in a few spots these have undergone ossification."

From a child, aged 5 weeks, who was under the care of Mr. Beck in U. C. H. (Shattock, Trans. Path. Soc. vol. xxxii, 1881, p. 197.)

2533. A small congenital sacro-coccygeal tumour removed by operation, in section. On one surface of the tumour is a piece of skin with numerous fine hairs. The section shows a loculated cyst, 12 mm. in its longest diameter, surrounded by a well-developed fibrous wall and embedded in fibro-fatty tissue. 9396

Microscopic Structure.—The cysts are lined with a single layer of columnar epithelium and around the cysts and in some parts opening into them are tubules lined with a similar epithelium. Numerous bundles of non-striated muscle-fibres and one or two areas of hyaline cartilage are present, and in one place there is a large area of epithelial cells massed together without intervening stroma.

From a female child, aged 12 months, who was under the care of Mr. H. J. Curtis in the North-Eastern Hospital for Children in July, 1903. The tumour formed a slight rounded prominence at the inner border of the right buttock and appeared to have a deep attachment to the edge of the sacrum. In removing the tumour it was found that it extended to the ventral aspect of the sacrum and coccyx, and lay in contact with the posterior surface of the rectum. The wound healed by first intention, and two months later the child was in good health. (Curtis, Trans. Path. Soc. vol. lv, 1904, p. 22.)

MALFORMATIONS OF THE RECTUM AND ANUS AND LOWER GENITO-URINARY TRACT.

The following are the most important malformations which may result from arrested or modified development of the hind gut, allantois, and neighbouring parts:—

1. The rectum is imperforate, the anal depression either being absent or, if present, not communicating with the gut. Many varieties of this malformation are met with :—(*a*) The rectum may end in a closed pouch beneath the skin of the perineum, the anus being absent; (*b*) the anal depression is present, but separated from the lower end of the rectum by a membranous septum (2534); (*c*) the rectum may end in a closed pouch at any level as high as the brim of the pelvis, the anal depression being either present or absent (2535, 2537).

   When the lower part of the rectum is absent its place may be taken by a fibrous strand; the other pelvic viscera occupy the hollow of the sacrum and the pelvic outlet is smaller than natural (2537).

2. The rectum has no opening in the normal situation, but communicates with the bladder, urethra, or vagina, the anal depression being present or absent. When the rectum communicates with the bladder or urethra the opening is usually very small and is situated either in the posterior part of the

trigone (2540) or in the floor of the prostatic urethra (2541). When the rectum communicates with the vagina the opening is in the posterior wall of the latter at its lower part and may be of sufficient size to act as an efficient outlet for the contents of the bowel (2543).

3. In addition to the above-described malformations of the rectum, more complicated forms are occasionally met with. Thus, for instance, the bowel may open in the sacral region, or on the anterior aspect of the abdomen below the umbilicus, in association with extroversion of the bladder (2546).
4. *Hypospadias.*—In this condition the floor of the urethra is wanting in some part of its extent (2548). The closed part of the canal may terminate at any point between the root of the penis and the under surface of the glans, and in front of the opening the unclosed part of the canal is represented by a groove extending forwards as far as the natural position of the meatus. In hypospadias the inferior part of the prepuce is usually imperfectly developed; the penis is often small and may be held down to the scrotum by a web of skin, so that during erection it becomes greatly curved downwards. In the most extreme form of hypospadias the penis is very small, the scrotum is cleft, and the testicles undescended, so that the external genital organs may closely resemble in appearance those of the female.
5. *Extroversion of the bladder and epispadias.*—The condition met with in this malformation is sufficiently illustrated by Nos. 2549–2552. Extroversion of the bladder is much more common in the male than in the female. Epispadias or cleft of the penis along its dorsal aspect is very rare except in association with extroversion of the bladder.
6. Patent urachus may exist in the form of a fistula, opening at the umbilicus and communicating with the bladder. Cysts may arise from distention of an unobliterated part of the lumen of the urachus, the extremities of which have become closed.

No. 2553 illustrates a rare malformation of the lower extremity of one ureter.

2534. The penis, bladder, and rectum, together with the pubic bones and the skin surrounding the anus, from a male infant. The bladder is large, but otherwise normal. The rectum is greatly dilated, and its walls thin and membranous; it has been laid open along its posterior aspect; when spread out, it measures 13 cm. across at its upper part; it terminates below in a cul-de-sac. The anal depression is well formed and about 1 cm. in depth; it comes into close contact with the dilated end of the intestine and the two communicate by a small opening which was made by operation. The end of the rectum is below the reflexion of the peritoneum from the gut to the bladder. The peritoneum has not been injured in the operation. 1273

Operation was performed on the third day after birth. Death occurred on the second day from peritonitis, the cause of which was not clear.

2535. The left half of the pelvis of a male infant. The rectum terminates in a pouch opposite the lower part of the sacrum; it is greatly dilated, measuring 2 cm. in diameter opposite the sacrum and 4 cm. at a higher level; its walls are thin and membranous. The anal depression is well formed, and 13 mm. in depth; there is a mass of connective tissue 10 mm. in thickness between the depression and the end of the rectum; this has been perforated by an operation, and a piece of whalebone has been passed through the narrow opening. The opening in the gut is towards its anterior aspect. The bladder and urethra are normal. 2875

2536. The skin of the vulva and perineum, with the bladder, uterus, rectum, and sacrum, from an infant born with imperforate anus. The bladder, vulva, and uterus are normally developed. In the position of the anus is a large irregular depression 2 cm. in diameter. Towards the posterior part of this, close to the tip of the coccyx, is an opening about 5 mm. in diameter. This leads to a track passing up in the concavity of the sacrum and opening into the posterior part of the rectum just above its termination. 4130

The child was 2 days old when brought to U. C. H. She was operated on by Mr. Quain, and lived for more than a month. The specimen shows the imperfect result which commonly follows these operations, unless the end of the gut can be found and brought down to the anus.

2537. The pelvic viscera, with the sacrum, left hip-bone and the lower lumbar vertebræ, from a female infant. Above the pubic bone in front is the distended bladder, terminating in the fibrous cord of the obliterated urachus. Behind this, lying against the bodies of the vertebræ, is the lower end of the large intestine, terminating in a cul-de-sac. It is greatly dilated, measuring about 3·5 cm. in diameter and terminates at the level of the sacral promontory. At the level of the crest of the ilium the gut becomes somewhat suddenly narrowed to about 1·5 cm. in diameter. The vagina, which is somewhat larger than natural, occupies the sacral hollow below the rectum. The uterus and its appendages are in the space between the bladder and rectum. The urethra is marked by a piece of whalebone passed into it. In the perineum is a well-marked anal depression in its normal situation ; it is about 10 mm. in diameter and 6 mm. in depth. In the present state the cul-de-sac, forming the end of the gut, is 3 cm. from the anal depression. 3361

2538. The sacrum and right hip-bone, together with the pelvic viscera, of a female infant. The bladder, urethra, and the lower ends of the ureters are normally developed. The left horn and appendages of the uterus are absent ; the vagina is normal. The rectum is dilated, measuring 2·5 cm. in diameter, and terminates in a cul de-sac on a level with the middle of the sacrum. From the gut a thick fibrous cord is continued downwards between the vagina and the sacrum and coccyx for a distance of 2 cm., where it joins the upper end of the anal depression, which measures 5 mm. in diameter and 8 mm. in depth.

2539. The pelvis and pelvic viscera of a male child, with the skin of the anus and a portion of that of the left iliac region. The rectum terminates in a dilated pouch at the brim of the pelvis. Its muscular coat is considerably hypertrophied. The anal aperture is well formed, but terminates about 1·5 cm. from the surface. Inguinal colotomy has been performed, the opening in the dilated bowel being indicated by a piece of glass rod. There are no signs of inflammation in the pelvic peritoneum. The right testicle is retained in the abdominal cavity.

The child was brought to the hospital on the fourth day. An attempt was made to reach the gut from the anal depression, but failed. Left inguinal colotomy was then performed by Mr. Beck. On opening the peritoneum, the gut was seen at some distance from the surface. It was seized with forceps and drawn into the wound. While this was being done it burst. It was quickly drawn out and sutures put in. The child died two days later of exhaustion. There was no peritonitis, and no meconium was found in the peritoneal cavity.

2540. The pelvic viscera of a male infant, with part of the skin of the perineum and of the left iliac region. The rectum is dilated and extremely thin ; it terminates at the base of the bladder and communicates with the latter by a fine opening, which is indicated by a bristle, and opens into the bladder in the middle line above the level of the orifices of the ureters. In the skin of the perineum is an incision 2·5 cm. in length, through which an unsuccessful attempt was made to reach the bowel. The sigmoid flexure has been sutured to an incision in the abdominal wall in the left iliac region, but has not been opened. 6454

The operation was performed when the child was 16 hours old, and it was intended to open the bowel on the following day. The child died a few hours after the operation. Both kidneys were cystic. (Surg. Reg. Rep. 1889, p. 22, No. 212.)

2541. The posterior part of the urethra, the bladder, and the lower part of each ureter and the rectum, from a male infant. The part of the large intestine preserved measures 11 cm. in length; it is thin and membranous in appearance; it has been laid open along its posterior aspect, and measures 5 cm. across when spread out; it terminates below in a rounded extremity, and communicates with the floor of the urethra at a point 8 mm. below the neck of the bladder. The opening is about 2 mm. in diameter, and a piece of glass rod has been passed through it. The bladder is dilated, oval in form, and measures 4·5 cm. in its longest diameter; its walls are abnormally thick and muscular. Both ureters are greatly dilated, measuring 12 mm. in diameter. 1435

2542. The bladder and rectum, with the soft parts and skin of the perineum, from a male infant born at full term. The rectum is greatly dilated, measuring 3 cm. in diameter; its muscular coat is hypertrophied. The rectum terminates in a rounded extremity on a level with the lower border of the prostate, and from its anterior part a narrow passage, through which a piece of glass rod has been passed, leads into the urethra, entering that canal immediately in front of the verumontanum. The bladder and urethra are otherwise normal. An incision has been made in the piece of skin which is preserved, and carried towards the rectum for some distance without reaching it. 5471

The operation was performed a few days after birth, but failed to give relief, and nothing more was attempted.

2543. The vagina, uterus, and part of the rectum, from a case of imperforate anus. The bladder has been dissected away, and the vagina opened anteriorly. In the posterior wall of the vagina is an opening leading directly into the rectum, through which a piece of glass rod has been passed. A pendulous fold of mucous membrane projects in front of this aperture. The rectum is dilated and measures 4·5 cm. in diameter; its muscular coat greatly hypertrophied. 5358

The specimen is from a child 2½ years old, admitted into U. C. H. at the age of 13 months, under Mr. Heath (Oct. 1868). There was no anus; the rectum opened into the vagina one inch from the lower end, the opening being not larger than a No. 8 bougie. An operation for artificial anus had been performed nine days after birth, and fæces had escaped; but the opening had closed. Mr. Heath reopened the gut in the line of the old cicatrix, but the communication was not sufficiently free, and in Dec. 1868 a free opening was made. The child made a good recovery and grew fat. In 1870, Feb. 25, death occurred rather suddenly with symptoms of enteritis. The rectum and sigmoid flexure were found greatly dilated, but not loaded with fæces. (Heath, Clin. Soc. Trans. vol. iii, 1870, p. 115.)

2544. The pelvic viscera of a female infant, together with a piece of the skin of the perineum. The uterus is bicornuate, the left horn being much larger than the right. The vagina, which was imperforate, is dilated, and at its lower extremity has been opened and sutured to the edges of an incision in the perineum. The lower extremity of the rectum has been laid open posteriorly; it terminates at a distance of 3 cm. above the perineum, and communicates with the vagina by a small opening, through which a piece of glass rod has been passed. The bladder and urethra are normal. The ureters and the kidneys, half of each of which are preserved, are dilated. 7943

From a child who was admitted into U. C. H. on the third day after birth. There was no anus, but the external genital organs appeared to be normal. Operation was performed by dissecting a small skin-flap from the lower part of the sacrum, dividing the latter and turning the lower fragment aside. In this way the posterior surface of what was thought to be the rectum was exposed; it was drawn down, sutured to the edges of a small incision in the natural position of the anus, and opened. Some watery fluid, not unlike turbid urine, escaped. Death occurred a few hours later. The specimen shows that the dilated vagina had been mistaken for the rectum. (Surg. Reg. Rep. 1898, p. 84.)

2545. The descending colon and rectum, with an oval portion of the skin and soft parts of the left loin. The intestine terminates in an oval sac measuring 2·5 cm. transversely and 5 cm. in its long diameter. Above this the colon is slightly dilated. The walls of the gut are thicker than natural. An opening in the skin communicates with the bowel laterally. The gut is firmly adherent to the parts around the opening. The artificial anus admits the tip of the little finger. There is no kink in the bowel opposite the opening. 6007

From a child, aged 18 days, on whom Mr. R. W. Parker performed left lumbar colotomy for imperforate anus. Death occurred a few days after the operation. There was no peritonitis. The distended end of the gut lay above the sacral promontory. The child had talipes calcaneus of one foot.

2546. The lower part of the anterior abdominal wall, with the pelvic viscera and the great intestine, from a female infant. Viewed from behind, in the middle line is a piece of intestine measuring 12 cm. in length; the upper 7 cm. of this is the lower end of the ileum, with the mesentery attached; the lower part is the cæcum, which may be recognised by the vermiform appendix attached to it. The diameter of the cæcum is about the same as that of the ileum. Beyond the cæcum the large intestine is continued for 3 cm., and then terminates in a cul-de-sac. Viewed from the front, an oval opening, 1·5 cm. in its vertical diameter, is seen communicating with the large intestine in the region of the cæcum. On each side of the specimen is a tube, into which a bristle has been passed; these are the ureters; they open superficially on each side of the oval opening before mentioned, towards its lower end and about 8 mm. from its margin. Viewed from behind, on each side of the large intestine is a vagina and uterus with a single Fallopian tube and ovary. The vagina and uterus have been laid open on each side. On the right side the vagina seems to end in a cul-de-sac beneath the rounded eminence by the side of the oval opening. On the left side an opening exists in the corresponding eminence, above that for the ureter, through which a piece of glass rod has been passed into the vagina. 2663

From a child, born at about the 7th month; death occurred a few days after birth.

2547. The lower part of the anterior abdominal wall of a female infant, showing malformations of the intestine and of the genito-urinary tract. At the upper part of the specimen the ligatured umbilical cord is seen, inserted into a thin membranous area continuous around with the skin and evidently indicating the position of an exomphalos. In the middle line immediately above the position of the pubes is a prolapsed portion of the small intestine, 5·5 cm. in length and directed upwards; on its free upper end is the opening of the lumen, from which a probe has been passed along the prolapsed portion into the small intestine, which still lies in the abdominal cavity, and which is considerably narrowed for a short distance before it passes through the abdominal wall. Near the lower part of the prolapsed bowel is a second, transversely elongated opening, and below this are three smaller openings, one median and two lateral; through these openings probes have been passed into the large intestine. The large intestine, which measures 5 cm. in length, ends blindly, and attached to it, close to the abdominal wall, is the vermiform appendix. On the anterior abdominal wall, on either side of the protruding intestine, is a corrugated surface about 3 cm. in diameter, each representing one half of the posterior wall of the extroverted bladder; each surface presents at its lower part the orifice of the corresponding ureter, through which a bristle has been passed into the ureter itself. On each side below the extroverted bladder-wall is an irregularly ridged cutaneous prominence, representing the separated halves of the external genitalia. Viewed from behind is seen the double uterus and vagina with the large intestine passing between them; the vaginæ have no external opening, and the left one is dilated into a hydrocolpos. The right kidney was situated in the pelvis. 9933

From a child who died on the 4th day after birth at full term; no other malformations were present. The mother had developed insanity during her pregnancy and was an inmate of Colney Hatch Asylum. The specimen was presented by Mr. Cecil Beadles.

2548. The penis of an adult with the deformity known as hypospadias. The urethra terminates about 1 cm. behind the glans, the opening being occupied by a piece of bougie. In front of the opening a deep groove extends forwards along the under surface of the glans as far as the normal situation of the urethral orifice. The prepuce appears to have been very imperfectly developed, especially below, and the frænum is absent.

2549. The lower part of the anterior abdominal wall, with the scrotum and perineum, of a child. There has been a complete want of union in the middle line from the umbilicus to the tip of the penis, giving rise to extroversion of the bladder and epispadias. The posterior wall of the bladder is thus exposed; it is pressed forwards by the contents of the abdomen, so as to form a hemispherical projection 3·5 cm. in diameter. At the lower part are two small nipple-like projections; these are the orifices of the ureters. The mucous membrane of the bladder is thickened and roughened by inflammation. Above the bladder the abdominal wall presents in the middle line a triangular slightly depressed area, 2 cm. in length, the apex of which corresponds with the position of the umbilicus. The penis is cleft along its upper aspect; it is short, scarcely projecting beyond the protruding bladder; it is unnaturally wide, and the prepuce forms a small fold hanging down from its under surface. The scrotum is wide and spread out. The testicles are in the scrotum. On each side of the depression, opposite the root of the penis, is a rounded eminence, filling the groin and corresponding to the body of the pubic bone on each side. The posterior aspect of the specimen shows that the rectus muscles are present and fully developed, but are separated below by an interval of 2·5 cm. Through this interval the posterior wall of the bladder projects forwards, forming a deep hollow, corresponding to the projection on the anterior aspect and lined with peritoneum. In removing the specimen the pubic bone, with the ramus of the ischium, has been preserved, the knife having passed through the thyroid foramen on each side. The pubic bones are separated by an interval of 3 cm., and the surface for the symphysis pubis is directed forwards. Between the bones passes a dense mass of fibrous tissue. 770

2550. The anterior abdominal wall below the level of the umbilicus, together with the scrotum and perineum, from a newly born infant with extroversion of the bladder and epispadias. The posterior wall of the bladder forms a smooth, convex, oval projection measuring 3 cm. transversely; the upper border is 1 cm. below the position of the umbilicus. The position of the ureteral orifices is indicated by two bristles. The penis is short and cleft along its dorsal aspect, the urethra being indicated only by a very shallow groove continuous above with the surface of the bladder. The prepuce forms a fold around the lower surface of the glans; the frænum is normally developed. The scrotum presents a central furrow between two slight projections corresponding with the position of the testicles. On the posterior surface of the specimen the recti, separated below by a distance of 2 cm., are seen. The position of the bladder is indicated by a deep depression, lined with peritoneum, along the upper border of which are seen the hypogastric arteries. The bones have been removed.

2551. A wax model illustrating extroversion of the bladder and epispadias. The projection formed by the bladder is 4·5 cm. in diameter; its upper part is covered by a thick layer of epithelium and resembles skin in appearance: the lower part is superficially ulcerated. The skin above the projection is scar-like in appearance, and the umbilical cicatrix is lost in it. There is a rounded prominence in each groin, continued downwards and meeting its fellow in the middle line below the diminutive penis. The scrotum is flattened out on this in the middle line. The prominence in each groin represents the separated pubic bones, and is possibly increased by the undescended testicles, which were evidently not in the scrotum.

2552. A wax model illustrating extroversion of the bladder and epispadias. The vesical mucous membrane is bright red in colour and apparently superficially ulcerated in the greater part of its extent. The surfaces of the projection are irregular. The orifices of the ureters are not clearly indicated. The prominence in each groin caused by the separated pubic bones is well shown. 2742

2553. The genito-urinary organs of a female infant presenting a malformation of the lower end of the left ureter. A section has been made of each kidney; the bladder and urethra have been laid open along the front, and the vagina along the posterior wall. The pelvis of the right kidney is dilated; the ureter is dilated and tortuous except at its junction with the pelvis of the kidney and immediately above its entrance into the bladder-wall, where its size is normal. The left kidney measures 7·5 cm. in length and is partially divided by a deep constriction at the junction of its upper and middle thirds; the upper third is dilated and the pelvis of this portion ends in a dilated and very tortuous ureter; the lower and larger part of the left kidney is also dilated and has a separate ureter, which is similar to that of the upper division, but less tortuous. The two ureters of the left kidney join 1 cm. above their entrance into the bladder. The bladder is slightly hypertrophied, and in the recent state presented the appearances of intense acute cystitis. The vesical orifice of the right ureter is normal in size and position; from a corresponding point in the left side of the bladder a raised column, 5 mm. across, extends downwards and ends in a bulbous enlargement, which, in the natural position of the parts, occupied the whole length of the dilated urethral canal and protruded externally between the labia; on its posterior surface this bulbous enlargement is attached to the floor of the urethra nearly as far as its orifice; on its right side it presents a long rent, freely opening the hollow interior from which a piece of glass rod has been passed upwards into the ureter. The orifice of the dilated urethra measures 1 cm. in diameter. The vagina and the uterus with its appendages are normal.

The specimen was obtained from an infant who died on the 10th day after birth. When first examined on the 7th day, a thin ruptured cyst, from which urine escaped, projected from between the labia; the rupture of the cyst had occurred on the 6th day, before which it had presented the appearance of a small egg. The child's death was preceded by vomiting and convulsions and doubtless resulted from renal infection.

The malformation of the lower extremity of the left ureter must have resulted from closure of the lower end of the tube with subsequent distension and rupture. (Trans. Path. Soc. vol. lii, 1901, p. 117.)

MALPOSITION OF THE TESTICLE.

The testicle, on one or both sides, may be arrested at any point in its descent between the level of the kidney and the bottom of the scrotum, or, having passed through the inguinal canal, it may take a course other than into the scrotum.

In *abdominal retention* the testicle usually lies near the internal abdominal ring (2556). The tunica vaginalis may be wanting, or an open processus vaginalis may extend into the inguinal canal and even reach the scrotum, and with the peritoneal process a loop of the vas deferens sometimes descends a variable distance (2557). The retained testicle is usually small and is probably incapable of spermatogenesis. Unilateral abdominal retention (monorchism) is not attended with any functional defect if the other testicle is normal, but bilateral retention (cryptorchism) probably always results in sterility and may be associated with some degree of defect of development. The testicle retained in the abdomen may be the seat of tumour-formation (2154).

In *inguinal retention* the testicle may be so placed that it readily slips above or below the internal abdominal ring, or it may descend so as just to enter the scrotum (2554, 2555). The testicle is usually smaller than natural and appears to be liable to degenerative changes, the result of its exposure to pressure and injury. The tunica vaginalis of a testicle retained in the inguinal canal usually remains in communication with the peritoneal cavity (2554), and into it a hernia is likely to descend (2557 A); if the tunica vaginalis is closed it may become the seat of a hydrocele (inguinal hydrocele). Torsion of the spermatic cord is much more liable to occur to an inguinal than to a normally placed testicle; venous engorgement and rapid swelling of the organ result and are likely to be followed by atrophy.

When one testicle is undescended the corresponding half of the scrotum is imperfectly developed.

In rare instances the testicle having passed through the inguinal canal, fails to enter the scrotum and is found in such situations as the perineum, the root of the penis, or the thigh.

A testicle lying in the scrotum is occasionally retroverted so that the epididymis lies in front of the body, and should a hydrocele be present the testicle lies in front of the fluid instead of behind it.

2554. Part of a left hip-bone together with the parts forming the inguinal canal. The external oblique has been divided upwards and outwards from the external abdominal ring, in order to display the testicle, which lies in the inguinal canal. The testicle, into which an incision has been made, presents to the naked eye a normal appearance, but is only 22 mm. in length. The upper extremity of the tunica vaginalis communicates with the peritoneal cavity; its lower end reaches 2 cm. beyond the testicle, and presents two small pouch-like protrusions. (See No. 2555.)

2555. Part of the abdominal wall of the right inguinal region, together with the testicle, from the same case as the preceding specimen. The testicle, although it has entered the scrotum, lies at a higher level than natural. The gland measures 3 cm. in length, and its substance, as displayed by a section, appears to be normal. The globus minor of the epididymis is unusually separated from the body of the testis, and the vas can be indistinctly traced, on the back of the specimen, passing upwards from it. The upper end of the tunica vaginalis communicates with the peritoneal cavity; the lower end reaches 3 cm. below the testicle. On the inner surface of the tunica vaginalis and on the peritoneum around the opening are numerous small deposits of inflammatory exudation.

From a boy, aged 16, in whom the right testicle had entered the scrotum at the age of 14, but the left testicle was retained in the inguinal canal. He was admitted into U. C. H. under the care of Mr. Beck in 1881, with a strangulated inguinal hernia on the right side. Operation was performed and a knuckle of deeply congested gut reduced. Death occurred on the third day; the gut which had been strangulated was gangrenous. (Surg. Reg. Rep. 1881, p. 142, No. 649.)

2556. A wax model of the interior of the abdomen in the right iliac region. The testicle lies in the abdomen immediately above and internal to the internal abdominal ring. The testicle is small, and the epididymis is situated along its mesial border. A rod has been passed into the processus vaginalis testis, which enters the inguinal canal. (See No. 2557.) 4338

2557. A wax model of the external aspect of the parts shown in the preceding specimen. The pouch of peritoneum representing the empty tunica vaginalis extends for a distance of 4·5 cm. below the external abdominal ring. The inguinal canal is slightly distended by the upper part of the funicular process. 4337

From a dissection prepared by Mr. Liston from the body of a man aged 35. The specimen is preserved in the Anatomical Series of University College Museum (MS. Catalogue 3568). The testicle was attached by a fold of peritoneum on the inner side of the internal abdominal ring. The vas deferens formed a loop extending 4 cm. into the inguinal canal, on the back of the funicular process. The distance from the lower end of the testicle to the lowest extremity of the tunica vaginalis is 9 cm.

2557 A. A testicle, together with a piece of strangulated omentum, removed by operation. The testicle itself presents a normal appearance, but the tissues of the part of the cord preserved are swollen and discoloured by congestion. The piece of omentum which was removed is consolidated and discoloured in its middle part as the result of the strangulation. 9634

From a boy, aged 12, in whom both testicles were undescended. Whilst at play, he was seized with sudden pain in the left groin, followed by vomiting: on the third day there was a painful swelling in the left inguinal canal, the upper part of which was formed by an oval lump which was thought to be the swollen testicle. Torsion of the spermatic cord was diagnosed and operation performed. The lump which had been regarded as the swollen testicle proved to be a small mass of strangulated omentum lying in the processus vaginalis above the testicle, which was itself normal. The testicle and omentum were removed.

CONGENITAL MALFORMATIONS OF THE UPPER LIMB.

Supernumerary fingers are not common. The supernumerary digit most commonly takes the form of a small pedunculated outgrowth attached to the ulnar border of the hand (2558). The thumb is sometimes bifid.

Congenital absence of one or more digits is less common (2565).

Syndactyly is common, two or more of the fingers being united by a web which is continued for a variable distance towards the ungual phalanx (2562). The hand is usually small.

Congenital absence of one of the bones of the forearm is rare. The radius is more often absent than the ulna. Absence of the radius is associated with absence of the thumb, and the hand is more or less displaced outwards (club-hand, 2563, 2564).

Congenital hypertrophy is most commonly limited to one or more of the digits.

2558. The hand of a new-born child with a supernumerary finger. The finger is 14 mm. in length, and is attached by a narrow pedicle to the inner side of the proximal segment of the little finger, slightly towards the palmar aspect. It has been divided by a longitudinal incision. It has no articulation with the metacarpus or with the little finger, the pedicle being composed entirely of areolar tissue and fat covered by skin. A narrow slip of cartilage runs down the finger to its distal extremity, but does not extend into the pedicle. At the extremity of the finger is a small perfectly formed nail. 5494

2559. Two supernumerary fingers removed by amputation. Each is composed of three segments, with a somewhat small and narrow nail.

2560. The right hand and part of the forearm of an infant. The index finger and thumb are completely fused together, forming one broad digit with two nails; a slight furrow is present on the dorsum. 2054

2561. A left hand from an adult, showing a condition of arrested development of the thumb and fingers. The palm is partially dissected. The ball of the thumb and the metacarpal bone are well developed. Beyond the head of the bone is a fleshy mass, having the form of a small ungual phalanx, but containing no bone. It had a small imperfect nail, which has separated in the spirit. The metacarpal bone of the index finger is shorter than natural, and at its distal extremity is a small rounded projection about the size of a pea, which represents the finger. The metacarpal bone of the middle finger is longer and has a slightly larger fleshy projection at its extremity, representing the finger. The metacarpal bones of the ring and little fingers seem to be fully developed, and beyond them are the fleshy nipple-shaped projections, curved towards the radial side of the hand, representing the fingers. That representing the ring finger is the longer, measuring about

2 cm. in length. The dissection of the palm shows that all the flexor tendons, both superficial and deep, with the lumbricales, are present, but smaller than natural. The tendons are continued into the fleshy masses representing the fingers. The muscles of the ball of the thumb and those of the little finger, as well as the interossei, are present and of good size.

2562. A right forearm and hand, partly dissected, with the lower third of the humerus, showing a peculiar arrest of development. The three inner digits are webbed as far as the roots of the nails; the index and middle fingers to the base of the terminal phalanx. The hand is flexed and adducted; there is complete ankylosis of the wrist. The thumb is flexed and displaced behind the other digits, the terminal phalanges of which are flexed to a right angle. The forearm is semiprone; the elbow is ankylosed at a right angle. The pronator teres is absent: the tendon of the flexor carpi radialis terminates in an expansion on the end of the radius. The palmaris longus ends in the fascia of the forearm; it has a wide origin from the humerus. The flexor sublimis digitorum sends tendons as usual to the fingers. The flexor carpi ulnaris ends in an expansion on the lower end of the ulna. The flexor longus pollicis ends in two tendons, one of which supplies the index finger; it also furnishes a slip to the annular ligament. The flexor profundus digitorum terminates in a broad tendinous expansion inserted into the outer portion of the ankylosed carpus. All the short muscles of the thumb and little finger are represented. An additional muscle arises from the annular ligament to the inner side of the superficial head of the flexor brevis pollicis, and is inserted into the integument between the thumb and index. The pronator quadratus is present, the interossei and lumbricales absent. The supinator longus is represented by a fibrous band, extending from the usual seat of origin to the upper end of the radius. The muscular tissue of the extensors is represented by a thin degenerated sheet on the back of the forearm, while the tendons are with difficulty traceable, being incorporated after atrophy with the periosteum of the conjoined radius, ulna, and carpus. Tendons can be indistinctly traced to all the digits except the thumb. The bones are much deformed. The humerus is narrowed laterally and presents scarcely any indication of a condyle on either side. The upper end of the radius lies above the ulna, though more to the outer than the inner side of the narrowed end of the humerus, to which both bones are ankylosed. The bones of the carpus are ankylosed to those of the forearm and to one another, so as to form a single osseous mass on which the metacarpal bones have slight mobility. The metacarpal bone of the index is dislocated backwards; that of the middle finger is not more than 1·5 cm. long, and is loosely connected with the carpus by fibrous tissue. None of the four inner digits possess more than two recognisable phalanges, a well formed ungual phalanx being normally connected with a phalanx of considerable length, which articulates with the head of the metacarpal bone and represents the first and second phalanges conjoined.

The patient was a young man, aged 22. The limb was successfully amputated by Sir J. Erichsen, as the patient desired to be rid of the deformity. (Shattock, Trans. Path. Soc. vol. xxxii, 1881, p. 276.)

2563. The bones of the upper limbs and those entering into the left knee-joint, from a fœtus of about the full term. The humerus in each arm is of full length and perfectly developed. In the right upper limb the radius is completely absent. The ulna is disproportionately short; its shaft is extensively curved antero-posteriorly; the articular ends are normal in form. In the hand the thumb is wanting, and there is an absence of the scaphoid and trapezium. The hand is prone, abducted, and semiflexed, the defective carpus articulating with the anterior surface of the lower end of the ulna, on which there is an oval articular surface on the anterior aspect and opposite to the styloid process.

In the left limb there is the same outward curve of the ulna; but the radius is present, though unnaturally short, even in proportion to the diminished length of the ulna. There is a rudimentary pedunculated thumb. The scaphoid and trapezium are absent. The substance of the lower epiphysis of the radius is intersected with fibrous tissue.

The knee was in a state of over-extension. The tibia seems in its present position to be a little more forward than natural. 5554

From a fœtus of full term. There was a spina bifida in the sacral region. The lower limbs were of about full size; the thighs did not admit of extension; the flexure of the knees was forwards, but dissection showed no reversal of the parts forming the knee-joint, which admitted of abnormal over-extension without proper flexion. The right elbow was much limited in flexion, even after all the soft parts except the ligaments had been dissected away. The testicles were undescended, and the scrotum and penis displaced behind the thighs. (Trans. Path. Soc. vol. xxxiii, 1882, p. 240.)

2564. The right upper limb of a fœtus at full term. The humerus and the muscles attached to it are normally developed. The radius is completely absent. The hand is displaced outwards at right angles to the forearm. The thumb and index are absent. 5823

2565. The right forearm and hand of a fœtus, in which the ring and little fingers are absent. The bones and muscles of the forearm are normal. The bones of the thumb and index are normal; the remaining digit, which appears to represent the middle finger, has three normal phalanges, of which the proximal one has a broad base which articulates with two separate metacarpal bones.

CONGENITAL MALFORMATIONS OF THE LOWER LIMB.

Congenital Dislocation of the Hip.

Congenital dislocation is more common in the hip than in any of the other joints, and, although more commonly unilateral, is often bilateral. It is much more frequent in the female than in the male. The dislocation must be regarded as the result of an imperfect development of the joint, and there is no evidence that it is due to injury or disease. The head of the femur usually lies above the acetabulum (2566), and the extent of the displacement on to the dorsum of the ilium will become increased by the action of the surrounding muscles and by the weight of the body when the child has learned to stand. The changes found in the acetabulum and in the upper end of the femur at birth are relatively slight, the most important being the small size of the acetabulum and of its margin (2566). At a later period the changes become more marked; the acetabulum grows imperfectly and tends to assume a triangular form; the head of the femur is small, and the part of its surface which rests against the ilium is flattened; the neck of the femur is short and the whole upper extremity of the bone is rotated forward. The lower part of the capsule which covers the acetabulum is contracted and the muscles around the joint are altered in length and direction.

2566. The pelvis and malformed lower extremities of a fœtus, the hip-joint on each side being dislocated. All the soft parts have been removed from the right limb, but the extremity of the left limb has not been dissected. On the right side the femur is well developed, but the neck is short. The head of the femur lies on the dorsum of the ilium immediately behind the anterior superior spine. The acetabulum is small and its border flattened; the round ligament is attached to the cotyloid notch, and passing across the acetabulum is inserted into the lower and posterior border of the head of the femur. The bones of the leg and foot are absent, the extremity of the limb before dissection almost exactly resembling that of its fellow. On the left side the capsule of the hip-joint has not been removed, but it is evident that the head of the femur lies above the acetabulum, but at a rather lower level than on the right side. Below the knee the limb is represented only by a small backwardly projecting stump, in which a bone can be felt; on the end of the stump is a small pedunculated nodule. 9936

Malformations of the Bones of the Lower Extremity.

The most important of these is absence, partial or complete, of one of the bones of the leg. The fibula is more often absent than the tibia, and in either case one or more of the toes of the corresponding part of the foot are wanting. The existing bone is usually strongly curved, and the foot is turned inwards when the tibia is absent and outwards when the fibula is wanting.

Nos. 2567 and 2568 illustrate rare malformations of the femur and tibia.

2567. A malformed right femur, the lower extremity of which is wanting. The head, neck and great trochanter are normal; the small trochanter is hidden by an irregular bony outgrowth which arises from the posterior and inner aspect of the bone at the junction of the neck and shaft, and terminates in a truncated extremity directed upwards and inwards. Slightly below the level of this bony projection the femur appears to have been the seat of an oblique fracture in which firm union has occurred with a slight angular deformity directed forwards. From the inner aspect of the middle of the shaft a stout process of bone 13 cm. in length projects inwards, downwards and slightly backwards and terminates in an irregular and apparently broken extremity. The whole bone thus assumes the form of an inverted Y, the angle between the unequal limbs of which is occupied by a thin bony plate having a sharp curved free border which terminates at one end on the inner surface of the lower end of the shaft of the femur and at the other extremity forms the lower border of the process before mentioned. The femur, excepting the lower extremity, measures 35·5 cm. in length, and presents an undue curvature concave externally. 2290

From the dissecting-room.

2568. The skeleton of an adult man showing a remarkable malformation of the lower limbs. Above the level of the pelvis the skeleton is normal except for a slight lateral curvature of the spine. The pelvis is rather below the average both in size and strength; in each hip-bone the acetabulum is wanting and its place is occupied by a small depression about 1·5 cm. in diameter; the obturator foramen is large and rounded. On both sides the anterior inferior iliac spine is enlarged and presents a smooth surface; on the right side this surface articulates with an irregular piece of bone 4 cm. in length, which is the only representative of the femur; on the left side the corresponding surface is in contact with two separate pieces of bone of smaller size.

On the right side the patella as well as the femur is absent. The tibia is short and presents at the middle of its inner border a stout projection, 11 cm. in length and terminating in a club-shaped extremity; the whole bone has thus a triradiate form. The length of the tibia measured along its curve is 27 cm.; the upper end, which is imperfectly developed, is ankylosed by bone to the head of the fibula. The fibula is straight and 25 cm. in length; the lower ends of the leg-bones are normal. On the upper border of the curved shaft of the tibia, at the point from which the process arises, is a small elevation indicating the position in which the bone was united to the pelvis by ligamentous bands. The bones of the foot present changes resulting from a great increase in the arch.

On the left side the lower extremity of the femur is present; it is imperfectly developed; it articulates with the tibia by two flattened surfaces and presents, on its upper surface, two rounded prominences resembling the condyles. The patella is absent. The upper extremities of the tibia and fibula are only slightly deformed, and the shafts of the bones present an undue curvature with the convexity forwards. The foot is flattened and the posterior articulation between the os calcis and astragalus is surrounded by irregular bony outgrowths. 5267

The description of the muscles of the lower limbs and of certain abnormalities which were present in the distribution of the blood-vessels will be found in a paper by Prof. G. Viner Ellis in the Med. Chir. Trans. vol. xxxvi, 1853, p. 439.

GENU RECURVATUM.

This is a rare congenital malformation, in which the knee is in a position of over extension and is incapable of full flexion.

2569. A knee-joint from a fœtus, divided vertically in the middle line, showing the appearance of the parts in genu recurvatum. The soft parts have been removed from one half of the specimen. The tibia lies more forwards than natural, the femur being in contact only with the posterior part of the articular surface, and in the undissected half of the specimen the knee is slightly over-extended.

From a fœtus with spina bifida.

MALFORMATIONS CAUSED BY THE CONSTRICTION OF AMNIOTIC BANDS.

These may consist in the presence of circular depressions at the constricted part (2570) or in complete separation of part of a limb (intrauterine amputation).

2570. A plaster cast of the lower part of the thigh and upper part of the leg of a child. Immediately below the knee is a deep depression surrounding the limb and probably caused by the constriction of an amniotic band. It is most marked behind in the situation of the muscles of the calf. In front, it is scarcely perceptible over the upper part of the tibia. 6085

CONGENITAL CLUB-FOOT.

It is probable that the most important element in the causation of congenital club-foot is malposition *in utero*.

Talipes equino-varus is the ordinary form of congenital club-foot. The heel is drawn upwards; the foot is flexed at its transverse tarsal articulation, so that its arch is greatly increased; the inner side of the foot is turned upwards, so that the sole is directed inwards (2571). The chief obstacle to the reduction of the deformity is the shortness of the tendo Achillis and of all the fascial, tendinous, and ligamentous structures at the inner side of the foot. At birth the tarsal bones are not markedly altered, except the astragalus, the front part of which is twisted inwards. If a child with uncorrected talipes equino-varus is allowed to stand, the weight is borne by the outer border of the foot, and in this situation a round callosity is formed (2573); the deformity becomes increased, and considerable alterations occur in the tarsal bones in conformity with the abnormal position of the foot (2576).

Talipes calcaneus is a rare form of congenital club-foot. The foot is over-flexed at the ankle and incapable of complete extension; the arch of the foot is flattened (2577).

Congenital club-foot may be associated with other malformations, especially spina bifida (2577).

2571. Plaster casts of the lower extremities of a young child, showing an extreme degree of bilateral congenital talipes equino-varus. 6166

2572. Plaster casts of the lower extremities of a child, showing an extreme degree of bilateral congenital talipes equino-varus. The deformity is more pronounced in the left limb. The muscles of the leg on each side are atrophied; those of the thigh are well developed.

From a female child, aged 5 years, who was admitted into U. C. H. under the care of Mr. Heath in 1886. Attempts were made, without success, to rectify the deformity by division of the ligaments and of the tarsus. Subsequently Pirogoff's amputation was performed on both sides. (Surg. Reg. Rep. 1887, p. 18, No. 2549.)

2573. Plaster casts of the feet of a child presenting an extreme degree of bilateral congenital equino-varus. Each foot presents on its outer surface a marked prominence caused by the thickening of the soft parts in the position in which the feet rested on the ground. 2834

2574. A plaster cast of a right foot showing a marked degree of talipes equino-varus. The heel is drawn up and the foot turned inwards at right angles with the leg. There is a marked prominence in the position in which the outer border of the foot rested on the ground.

From a child, aged 9 years.

2575. A plaster cast of the left foot of an adult suffering from talipes equinus. The foot is in a position of extreme extension, so that the tarsus in front of the astragalus is almost in a line with the bones of the leg, the heel forming a slight projection behind. The toes are over-extended so as to be placed at right angles to their metatarsal bones. There is no lateral displacement. The head of the astragalus forms a projection in front of the ankle-joint. The arch of the foot is increased. The chief displacement seems to have been at the transverse tarsal joint, the os calcis and astragalus remaining in the normal position of extreme extension of the ankle, while the navicular and cuboid carrying with them the rest of the foot have been displaced downwards to such an extent as to amount to a partial dislocation. 2824

The old catalogue states that the disease was congenital. At 27 years of age the tendo Achillis was divided, but the result is not stated.

2576. The bones of the tarsus and metatarsus, with the lower ends of the tibia and fibula, from an adult who suffered from congenital talipes equino-varus. The ankle-joint is over-extended, and the astragalus displaced forwards, so that the posterior border of the articular surface of the tibia is in contact with the upper surface of the os calcis, and a new articular surface 13 mm. in diameter has formed between them. The upper part of the posterior border of the external malleolus also touches the os calcis. The astragalus and os calcis are slightly rotated inwards. The anterior part of the foot in front of the os calcis and astragalus is in a position of extreme over-flexion and adduction, so that in the erect position the dorsum of the foot is directed downwards, the plantar surfaces of the bones being turned upwards and somewhat inwards and backwards. The foot would thus have rested on the dorsal surfaces of the cuboid and of the metatarsal bones of the fourth and fifth toes, and the toes would have been directed backwards and inwards. The astragalus is considerably altered in form; it is small, the head especially being smaller than natural; about half of the articular surface for the fibula lies exposed in front of that bone; it is rough and irregular on the surface, and its articular cartilage has evidently been absent; the anterior half of the superior articular surface is in the same state; the greater part of the head is uncovered, rough and irregular. The navicular has formed a new articulation on the under surface of the astragalus; the tubercle of the navicular is within 5 mm. of the tip of the inner malleolus. The cuboid has been dislocated downwards and backwards, and has formed a new articulation on the under surface of the os calcis immediately behind its normal position. The anterior articular surface of the os calcis thus exposed has become much altered in shape; it is rough and irregular, and has evidently not been covered by cartilage. The os calcis is marked by a very deep groove for the tendon of the peroneus longus. The metatarsal bones preserve their normal relations to the tarsus. 1796

2577. A section of the tibia and foot from a case of congenital talipes calcaneus. The bones of the tarsus, so far as they are shown in the section, seem to be of normal form. The ankle-joint is in a position of extreme flexion, the angle formed by the tibia and the line of the tarsal bones being about 45°. The sole of the foot is flat, the arch being completely lost. 5520

The child was also the subject of spina bifida. (See No. 2522.)

Malformations of the Toes.

These closely resemble the corresponding malformations in the upper limb, and include chiefly absence of one or more of the toes (2578), the presence of supernumerary digits (2580), congenital enlargement, and webbing of the toes.

Hammer-toe is a deformity, probably of congenital origin and usually affecting the second toe. It is characterised by a persistently flexed position of the joint between the first and second phalanges (2581).

2578. The feet of a fœtus of about full term, the left having been dissected. In the right foot the second and third toes are absent, and the fourth and fifth are united up to their extremities; a deep cleft separates the latter from the great toe, which is turned outwards. The left foot presented, before dissection, a similar malformation; all the bones of the first, fourth, and fifth toes are present; the bones of the second toe are wanting, and of those of the third only the metatarsal is present.

2579. A plaster cast of the anterior part of a left foot, in which a supernumerary digit is present. The latter, which consisted of two phalanges, projects horizontally outwards at right angles to the base of the fifth toe. 6886

From a girl, aged 14. The supernumerary toe was removed; the proximal phalanx of the little toe was bifid. (Surg. Reg. Rep. 1891, p. 26.)

2580. The anterior part of a right foot removed by amputation through the mid-tarsal joint; two supernumerary toes are present. The front of the foot is unnaturally broad, and the outer border too convex. Of the toes of the normal series only the great toe is abnormal; it is unnaturally broad, especially at its distal extremity. On the inner side of the great toe are two supernumerary digits; the outer of these is nearly as large as the second toe of the normal series; the other measures only 2 cm. in length. 7806

There were also two supernumerary toes on the other foot.

2581. A hammer-toe, removed through the metatarso-phalangeal joint. The first interphalangeal joint is flexed to an angle of 130°. 9485

The specimen is the second toe, and was removed from a man, in whom the second toe of the other foot had previously been amputated for a similar condition.

2582. A hammer-toe, removed through the metatarso-phalangeal joint. The first interphalangeal joint is flexed to a right angle, and a corn has developed over its dorsal aspect. 8789

The specimen is the second toe of the left foot. From a boy, whose only brother and only two sisters had all had the second toe of the left foot removed for a similar condition.

ACQUIRED DEFORMITIES.

Lateral Curvature of the Spine.—Scoliosis.

Scoliosis, or lateral curvature of the spine, may occur in infancy as a result of rickets, but more commonly it gradually develops during adolescence, at the period when genu valgum and flat-foot are common, and is then the result of weakness of the muscular and other structures by which the erect position of the spinal column is maintained, often aided by faulty positions of sitting and standing. Although the direction of the lateral curve is not constant, in the large majority of cases the curve in the dorsal region is convex towards the right, and above and below this region curvatures are present in the opposite direction (2583). The lateral curvature is always accompanied by a rotation of the vertebræ on their vertical axes, the direction of the rotation being such that the bodies of the vertebræ are directed to the convex, and the spinous processes to the concave, side of the curve (2585). This rotation is especially important in determining the well-marked deformity of the thorax which always occurs in cases of scoliosis (2586).

The skeleton of a case of well-marked and old-standing scoliosis shows the following features:—The lateral curvature is usually most pronounced in the lower dorsal region where the convexity is directed to the right side. The accompanying rotation of the vertebræ leads to an undue backward prominence of the ribs on the right side of the spine and an unusual flattening on the left side (2586); in front, on the other hand, the left side of the chest is the more prominent and the sternum is carried to the right of the mesial line. The right scapula, displaced by the deformity of the chest-wall, projects unduly backwards and is usually higher than its fellow. In the lumbar region the convexity is usually directed to the left, and the pelvis is tilted so that the right side is higher than the left; the distance between the ribs and the iliac crest is increased on the left side and diminished on the right. A similar curve, convex to the left, is present in the upper dorsal and cervical region.

In old-standing cases of lateral curvature the vertebræ undergo alterations in shape in conformity with the altered shape of the column. The most striking alteration is the wedge-shape of the vertebral body, which is often considerably diminished in its vertical measurement on the side corresponding to the concavity of the curvature (2585).

Lateral curvature of the spine may develop secondarily in various conditions. Thus, it may be produced by contraction of one side of the chest, such as may follow the healing of an empyema, and frequently results from inequality in the length of the lower limbs. Scoliosis is also an occasional symptom of syringomyelia and Friedreich's disease.

2583. A plaster cast of the posterior surface of the trunk of a female, showing the deformity resulting from a moderate degree of lateral curvature of the spine. The curvature is most marked in the lower part of the dorsal region, where the convexity of the curve is directed to the right. In the lumbar region there is a less marked curve in the opposite direction. As a result of the rotation of the dorsal vertebræ considerable deformity of the wall of the chest has occurred: on the right side the lower ribs are thrown backwards and unusually curved, so as to produce a marked prominence, which at the upper part is increased by the corresponding displacement of the scapula. On the left side the lower ribs are unusually flat and the hollow between the chest and the hip is much more marked on this side than on the other. S837

2584. The cervical, dorsal, and lumbar vertebræ from a case of lateral curvature. The most-marked curvature is situated in the lower dorsal region, the convexity of the curve being directed to the right. Above and below this are slight compensating curves in the opposite directions. At the seat of the maximum curvature in the dorsal region the vertebræ have undergone slight rotation on a vertical axis, the spinous processes being directed to the left or concave side, and the bodies to the right or convex side, of the curve. At the seat of maximum curvature the bodies of the vertebræ present a well-marked difference in the vertical measurement on the two sides; thus, the body of the 7th dorsal vertebra measures 1·5 cm. in thickness in its left half and 2 cm. in its right half. 1350

2585. A vertebral column showing an extreme degree of lateral curvature with rotation of the vertebræ. In the dorsal region the convexity of the curvature is directed to the right, the greatest prominence being at the level of the 6th dorsal vertebra. In the dorsi-lumbar region a slightly less marked curvature is present, having its convexity directed to the left and most marked at the level of the 2nd lumbar vertebra. The curve in the cervical spine is slightly marked and convex to the left. Associated with the lateral curvature is an extreme degree of rotation of the vertebræ, the direction of the rotation being such that in each part of the spine the bodies of the vertebræ are directed to the convex, and the spinous processes to the concave, side of the curve. As a necessary result of this rotation the curve formed by a line passing through the bodies of the vertebræ is much more extreme than that indicated by a line joining the tips of the spinous processes. In those situations where the curves are most extreme the bodies of the vertebræ present a wedge-shape due to considerable inequality in their vertical thickness on the two sides: thus the 1st and 2nd lumbar vertebræ with the intervening disc measure 7 cm. on the left side and only 3·5 cm. on the right side. In those vertebræ which present the most extreme rotation a further want of symmetry has resulted from the deviation of the spinous process from the mesial plane of the body at the vertebra. A further evidence of the unequal growth of the vertebræ on the two sides of the column is seen in the relatively small size of the transverse processes of the dorsal vertebræ in the concavity of the curve. From the contiguous borders of the bodies of the 1st and 2nd lumbar vertebræ on the right side two bony prominences project and articulate one with the other, forming a strong buttress of support. The sacrum is asymmetrical, being altogether smaller on the left than the right side. 181

2586. Part of the vertebral column together with the ribs from a case of extreme lateral curvature and rotation of the spine. The characters of the deformity of the column are very similar to those seen in the last specimen. The resulting deformity of the chest-wall is well shown. As a consequence of the rotation of the dorsal vertebræ, especially in the lower half of the dorsal region, the attachments of the ribs are carried backwards on the right side and forwards on the left side. The posterior surface of the chest-wall on the left side is thus rendered unusually flat and receding, whereas on the right side the ribs project prominently backwards and present an extreme degree of curvature at and in front of their angles. Furthermore, the ribs on the left side are closely crowded together and the individual ribs, especially the lower ones, are much more slender than their fellows of the opposite side. The capacity of the chest, especially in the antero-posterior direction and on the right side, is greatly reduced. 9161

From a woman, aged 26.

2587. Part of a spinal column presenting an extreme degree of lateral curvature and rotation, the right halves of the bodies and the right laminæ having been removed. The specimen shows that, in spite of the extreme degree of the deformity, there is no alteration in the capacity of the spinal canal. 151

SPONDYLOLISTHESIS.

Spondylolisthesis is an acquired deformity of the spinal column characterised by a forward and downward dislocation of the body of the 5th lumbar vertebra at the sacro-vertebral junction. Except in rare instances, the inferior articular processes of the vertebra retain their normal relation to the sacral articular processes, and the neural arch undergoes an apparent elongation. In slight degrees of the deformity the anterior part of the body of the 5th lumbar vertebra forms a projection which overhangs the cavity of the true pelvis. In more marked degrees the displacement is associated with changes in the form of the upper sacral vertebræ, and the body of the 5th lumbar vertebra descends into the pelvic cavity, and, occupying a position in front of the upper sacral vertebræ, produces the deformity characteristic of the spondylolisthetic pelvis; this condition renders the normal passage of the fœtus through the pelvic canal impossible.

The body of the 5th lumbar vertebra, in its descent into the pelvic cavity, becomes rotated, its upper surface being turned more or less directly forwards; the lumbar part of the column is inclined forwards, and a well-marked compensatory lordosis develops.

The exact mode of production of the deformity is not certainly known. In its slighter forms it is stated to have been produced, in apparently normal columns, by the carrying of heavy weights. Most commonly it is associated with injury of or defect in the 5th lumbar vertebra, such as congenital fissure or fracture of the neural arch or imperfect development of the inferior articular processes.

2588. The last four lumbar vertebræ, together with the sacrum and the first piece of the coccyx. The bones, excepting the 2nd and 3rd lumbar vertebræ, have been divided in the median plane. The body of the 5th lumbar vertebra, which is smaller than normal, is dislocated downwards and forwards from the upper surface of the sacrum, and is ankylosed by bone to the anterior half of the surface, leaving the posterior half free. The curvature of the sacrum in its upper part is increased, owing to a forward inclination of the upper two sacral bodies and to an alteration in their form; as a result of these changes, the superior articular surface of the sacrum is turned directly forwards. The body of the 5th lumbar vertebra and the adjacent part of that of the 1st sacral form a prominent mass which projects into the hollow of the sacrum and inferiorly reaches the level of the second pair of anterior sacral foramina. The laminæ of the 5th lumbar vertebra are depressed on to the back of the sacrum, the lower border of the spinous process being on a level with the first pair of posterior sacral foramina. The two bones are firmly ankylosed. The posterior wall of the sacral canal is defective for nearly 4 cm. below the spinous process of the 5th lumbar vertebra. Between the laminæ and the body of the 5th lumbar vertebra there is a mass of bone on each side, measuring nearly 5 cm. in length, which is fused superiorly with the lamina of the 4th lumbar vertebra and inferiorly with the base of the sacrum. The body of the 4th lumbar vertebra has the normal relation to that of the 5th, but the arch is displaced and occupies a horizontal position. Articular facets are present on the adjacent borders of the 2nd, 3rd, and 4th lumbar spinous processes. 3995

From the dissecting-room. (Obstet. Soc. Trans. 1900, vol. xlii, p. 75.)

ACQUIRED DEFORMITIES OF THE LOWER LIMB.

Coxa Vara.

Coxa vara is a deformity characterised by adduction of the thigh resulting from an alteration in shape of the upper end of the femur. The adduction is usually associated with external rotation and limitation of flexion. The limb is shortened. The change in the upper end of the femur usually consists in an alteration of the curvature of the neck, which forms with the shaft a smaller angle than natural and also becomes curved in such a way as to present a convexity forwards. Coxa vara may gradually develop in early life probably as the result of rickets, or may occur without obvious cause in a similar way to genu valgum. It may also result from various pathological and traumatic causes, such as rheumatoid arthritis, tuberculous disease, fractures of the neck of the femur, and injuries of the epiphysis.

GENU VALGUM.

In genu valgum the normal deviation of the long axis of the leg from the long axis of the thigh is increased, producing the deformity commonly known as "knock-knee." When occurring in early life the deformity is undoubtedly the result of rickets, but when, as is not uncommon, it gradually develops in adolescence, it probably results from general weakness of the liagmentous and other structures supporting the knee-joint. The chief change in the bones found in association with genu valgum is an apparent elongation of the internal condyle, which is probably due to an unequal rate of growth in the inner and outer parts of the lower epiphysial line of the femur. In some instances the deformity appears to result from a rickety curve in the shaft of the femur, and very commonly the upper end of the tibia is altered in form and shares in the production of the deformity.

The operation for genu valgum illustrated in No. 2590 has been entirely superseded by osteotomy of the femur above the epiphysial line.

Genu valgum may occasionally result from diseases and injuries of the knee-joint and also from fractures of the articular extremities of femur and tibia.

2589. A coronal section of the lower extremity of a left femur from a case of double genu valgum. (See No. 2590.) 5429

2590. The bones entering into the right knee-joint, with some of the ligaments, from the same case as the preceding specimen, Ogston's operation having been performed. The inner condyle has been separated from the femur by a saw-cut. The line of the cut forms from above downwards an angle of about 150° with the longitudinal axis of the femur. From before backwards it is inclined very slightly inwards. The periosteum at the posterior aspect of the bone is intact. The posterior crucial ligament has been reached by the saw, but its attachments are uninjured. The cartilages of the joint have apparently lost their polish. The periosteum of the femur is loosened as far as shown in the specimen.

In the present position of the parts the inner condyle is displaced slightly upwards so as entirely to correct the genu valgum.

From a male child, aged 6 years. Death occurred sixty-seven hours after the operation on the right femur. There was suppuration in and around the quadriceps as high as the upper third of the thigh. There was consolidation of the lower lobe and part of the upper lobe of the right lung. (Surg. Reg. Rep. 1878, p. 49.)

CONTRACTION OF THE KNEE.

Contraction of the knee-joint is liable to occur in any condition, especially chronic disease of the joint itself, in which the joint is allowed to remain for long periods in a flexed position. In such circumstances the upper end of the tibia becomes gradually displaced by the action of the hamstring muscles on to the posterior aspect of the condyles of the femur, and at the same time the leg rotates outwards. The faulty position thus assumed may berendered permanent by contraction of the tendinous and ligamentous structures of the joint or by fibrous or osseous ankylosis, if the deformity has resulted from articular disease. Specimens of contraction of the knee-joint with osseous ankylosis are preserved in Nos. 1041, 1044 to 1047.

2591. Plaster casts of the lower extremities of an adult showing an extreme degree of contraction of the knee-joint and acquired club-foot. In the right limb the knee is flexed to a right angle; the upper end of the tibia is displaced considerably backwards and the leg is rotated outwards; there is an extensive depressed scar on the upper part of the leg on the inner side; the heel is drawn upwards and the foot so considerably inverted that the inner border looks upwards and the sole inwards. In the left limb the deformity is similar, but more extreme; the knee is flexed to less than a right angle and there is a scar on its outer aspect; the deformity of the foot is even more marked than in the opposite limb.

From a woman, aged 22, who was under the care of Mr. Berkeley Hill in U. C. H. between June 1886 and June 1888. The deformity, which had been present since childhood, resulted from infantile paralysis and tuberculous disease of both knees. The position of the limbs was eventually greatly improved by excision of the left knee, osteotomy of both femurs, and the division of ligaments and tendons in the feet. (Surg. Reg. Rep. 1888, p. 22, No. 1201.)

Acquired Club-foot.

Club-foot, when occurring as an acquired deformity, is most commonly the result of infantile paralysis. The deformity is produced chiefly by the traction exerted on the foot by those muscles of the leg which retain their power, while the opposing muscles are paralysed.

Unless the position is corrected by treatment at an early stage the deformity is followed by contraction of those ligamentous and other structures which are shortened by the altered position of the foot, and alterations in the bones themselves may eventually ensue.

The most common form of acquired club-foot is talipes equinus;this may result from the unopposed action of the calf-muscles in cases in which the anterior muscles of the leg remain paralysed. The opposite condition of talipes calcaneus is not uncommon as a result of paralysis of the calf-muscles.

Deformities resembling the different forms of club-foot may result from such causes as fractures in the neighbourhood of the ankle, disease of the ankle-joint, and the contraction of cicatrices following abscesses and injuries of the calf.

2592. The lower third of the bones of the leg with those of the foot, from a case of acquired talipes equinus. Some of the ligaments have been preserved. The bones are atrophied. The astragalus is slightly displaced forwards and rotated inwards, carrying the foot with it; the articular surface for the fibula lies almost entirely in front of that bone, the anterior border of the malleolus being in contact with the posterior edge of the articular surface; the articular surface for the tibia is nearly in its normal position. The os calcis has its normal relations with the astragalus. The foot is forcibly flexed at the transverse tarsal joint, so that the line of the bones of the little toe and cuboid is nearly at right angles to the under surface of the os calcis. A great part of the surface of the head of the astragalus is exposed by the displacement of the navicular. The other bones are in their normal relation one to another. The toes are extended. 1061

The deformity was probably the result of want of use of the limb either from paralysis or from disease of the knee or hip, with long confinement to bed.

2593. The inner half of the lower part of the tibia, with the os calcis and astragalus and the soft parts covering them, from a case of talipes equinus. The tendo Achillis has been divided. The ends of the divided tendon are about 1·5 cm. apart. The fibres of the upper end have curved slightly backwards, those of the lower end are directed slightly forwards, and the space between them is filled by a partly decolorised blood-clot. The ankle-joint is still in a state of full extension. The articular cavity is filled by a thin layer of fibrous tissue, uniting the cartilage-covered surface of the tibia to that of the astragalus. A similar thin layer of fibrous tissue unites the posterior articular surface of the astragalus to that of the os calcis. 5443

The tendon was divided as an attempt to relieve old-standing talipes equinus. Owing to the fibrous ankylosis of the ankle-joint, the operation gave no relief, and the limb was amputated six days afterwards.

2594. A plaster cast of a right foot, showing an extreme degree of acquired talipes equinus. The heel is so much drawn up that the foot lies in almost a direct line with the leg. The great toe is in a position of hallux valgus, and its extremity lies beneath the second toe. 6880

The deformity resulted from infantile paralysis.

2595. The lower part of the left tibia and fibula, with the bones of the foot, from a case of acquired talipes equino-varus. The lower ends of the tibia and fibula are much altered in shape by irregular masses of new bone formed as the result of previous inflammation. The space between the tibia and fibula, as high as it is shown in the specimen, is bridged by masses of new bone. At the inner side of the tibia a portion of the bone, measuring 6 cm. in length, is slightly elevated, and has apparently been either a splinter or the lower end of the upper fragment in an oblique fracture. The astragalus and os calcis are nearly in the normal position, the heel being slightly drawn up; they are united to each other and to the bones of the leg by irregular masses of new bone. The anterior part of the foot, in front of the transverse tarsal joint, has been forcibly adducted and inverted. The bones are firmly fixed in their abnormal situation by bony ankylosis. The anterior bones of the tarsus and the metatarsus retain their normal relations. The toes are all over-extended at the metatarso-phalangeal joints, and the great toe is fixed in this position by bony ankylosis. The second phalanges are forcibly flexed on the first, but not ankylosed. 1062

The foot had probably become deformed during long rest in bed, after a fracture of the bones of the leg.

2596. A dissected specimen of talipes equino-varus from the adult. As far as they can be seen, the bones are in the same position as in the last specimen. The foot is over-extended at the ankle-joint, and flexed to the extent of partial dislocation, with extreme adduction at the transverse tarsal articulation. The arch of the foot is thus greatly increased, and the concavity is directed upwards, backwards, and inwards. The toes are forcibly flexed. The plantar fascia is shortened and stretches tightly across the abnormally concave arch of the foot. The muscles and tendons, except the tibialis anticus, show no alteration beyond that caused by the altered position of the parts. The tendon of the tibialis anticus divides opposite the navicular into two nearly equal parts, one of which is inserted into the internal cuneiform, and the other passes over the navicular to the dorsal surface of the middle cuneiform. The tendon of the extensor proprius hallucis passes between these two divisions of the tibialis anticus, which seem to have bound it down. Over the base of the metatarsal bone of the fifth toe some of the dense fibrous tissue resulting from pressure in walking has been left; the tendons of the peroneus brevis and peroneus tertius are lost in it. 3561

The specimen was taken from the body of an adult man in the dissecting-room. The muscles of the calf were badly developed.

2597. A plaster cast of a left foot, showing a slight degree of talipes equino-varus. The ankle is slightly extended. The whole foot is rotated inwards so that it rests upon its outer border, the inner side being slightly raised. The arch of the foot is greatly increased, and the part of the foot in front of the transverse tarsal articulation is adducted. The great toe is over-extended and abducted. The head of the astragalus forms a slight prominence towards the outer side of the dorsum of the foot, about 5 cm. in front of the external malleolus. 2837

The MS. Catalogue states that the deformity was acquired. The patient was a child aged twelve years. The position was much improved by division of the tendo Achillis.

Pes Cavus.

The exact mode of production of hollow claw-foot, which is usually met with as an acquired deformity in children and young adults, is not clearly understood. The deformity is characterised by an exaggeration of the plantar arch of the foot. In well-marked cases this is associated with a deformity of the toes, which are over-extended at the metatarso-phalangeal joints and flexed at the interphalangeal joints, thus assuming the position met with in "hammer-toe" (2598). At the same time a slight degree of talipes equinus is often present. It is probable that the deformity is usually a result of infantile paralysis; a similar deformity is also met with in Friedreich's disease. The structures of the sole, especially the plantar ligaments and fascia, become secondarily shortened.

2598. Plaster casts of the feet of a man with well-marked pes cavus. Both feet are affected to the same degree. The arch is greatly increased, so that the anterior tarsal bones form a marked prominence on the dorsum of the foot. The increase of the arch is so marked that no part of the sole between the heel and the heads of the metatarsal bones touches the ground. The metatarsal bones are flexed abnormally at their articulation with the tarsus, that of the great toe forming an angle of about 135° with a line drawn through the longitudinal axis of the os calcis. The first phalanges of all the toes are displaced upwards and backwards, so as to be placed at right angles to their metatarsal bones. The heads of the metatarsal bones thus left uncovered by the phalanges project markedly in the sole of the foot. The extensor tendons form prominent ridges on the dorsum at the roots of the toes. The toes are fully flexed at the first interphalangeal joints, so that the two distal phalanges are at right angles to the proximal, as in the condition known as "hammer-toe."

2599. A plaster cast of a right foot showing a slight degree of pes cavus.

Flat-foot.

In flat-foot the arch of the foot is diminished, so that in extreme cases the inner border of the foot may rest entirely on the ground in the erect position. The loss of the antero-posterior arch leads to lengthening of the foot, especially as measured from the prominence of the heel to the extremity of the great toe, and by the flattening of the transverse arch the foot is broadened. The extreme degrees of flat-foot are usually associated with some eversion (talipes valgus) and also with abduction of the front part of the foot. By the sinking of the arch of the inner border of the foot the tip of the internal malleolus is depressed and in front of it the head of the astragalus forms a well-marked prominence. In the earlier stages the arch of the foot can be restored by manipulation, but later the flattened foot becomes rigid as the result of the shortening of the ligaments and other structures which were relaxed.

Flat-foot usually develops during the period of adolescence from weakness of the structures which normally maintain the arch of the foot, and is thus very similar in its mode of origin to scoliosis and genu valgum, with which it is often associated. Less frequently it results from injury, paralysis, and rheumatic affections of the ankle and foot.

2600. A plaster cast of the right foot of a young adult, showing an extreme degree of flat-foot. The whole foot is slightly everted and its arch is entirely obliterated. Below and slightly in front of the internal malleolus is a prominence caused by the astragalus.

HALLUX VALGUS.

In hallux valgus the great toe is more or less markedly turned outwards at the metatarso-phalangeal joint, which may be partially dislocated. The head of the metatarsal bone is thus rendered unduly prominent and over it the integument becomes thickened and a bursa forms (bunion, 2602). The bursa is liable to become inflamed, and if suppuration occurs the joint may be involved. Hallux valgus is usually the result of the pressure of ill-fitting boots, but it appears to be due sometimes to chronic disease of the metatarso-phalangeal joint, as in rheumatoid arthritis (978–980).

2601. Plaster cast of a right foot and lower part of the leg, illustrating the distortion arising from the use of ill-fitting boots. The great toe is adducted and overlapped by the second; the head of the first metatarsal bone, thus exposed on the inner side, is considerably enlarged. The natural hollow of the sole is exaggerated, and the foot is slightly twisted outwards. 5066

2602. Plaster cast of a right foot, distorted from the use of ill-fitting boots. The great toe is extremely adducted, the head of the metatarsal bone thus exposed being greatly increased in size and forming a smooth hemispherical swelling (bunion) on the inner side of the foot. The adjacent toes are also much abducted, the metatarso-phalangeal joints being also over-extended, whilst the interphalangeal joints are flexed.

INJURIES AND DISEASES OF THE NOSE.

GANGRENE OF THE SKIN OF THE NOSE.

This may occur from extreme feebleness of the circulation, but is much more frequently a consequence of frost-bite.

2603. Part of a nose, the skin covering the tip of which has become gangrenous. The gangrenous area is slightly swollen, and is of a grayish-brown colour; around the margin it shows commencing separation. 1789

From an old man after fever. The lower extremities were also gangrenous to some distance above the ankles. No disease of the arteries was detected.

HYPERTROPHY OF THE SKIN OF THE NOSE.

In this affection all the structures of the skin and subcutaneous tissue are hypertrophied. There is thus formed a tumour often of considerable size, red in colour, irregular in outline, and frequently lobulated, or even pedunculated. Its surface is coarse and marked by deep pits; a section shows that there is a true hypertrophy of the skin. The papillæ are exaggerated in size, and covered by abnormally thick epidermis; the cutis vera and subcutaneous tissue are also greatly increased in quantity. In the thickened tissues are enlarged sebaceous follicles, often reaching the size of a pea; they are tensely distended with secretion, and in them the Demodex folliculorum is often present. The whole mass is abundantly supplied with vessels of considerable size. The condition is usually attributed to the congestion of the nose resulting from chronic dyspepsia, especially that form induced by drink. The hypertrophied skin can be easily removed by operation, and the surface heals rapidly, leaving but little deformity.

2604. A portion of greatly hypertrophied integument removed from the tip of the nose. Its greatest thickness is nearly 2 cm. The surface is uneven, and scattered over it are small conical pits which lead to hypertrophied sebaceous follicles. 3580

2605. A portion of hypertrophied integument from the nose. It consists of a central and two lateral masses. The surface is deeply pitted, the pits leading to the ducts of enlarged sebaceous follicles. The section has a dense fibrous structure. 3576

Microscopic Structure.—A section shows a thick layer of dense vascular fibrous tissue, in the superficial parts of which are many large sebaceous glands opening on the surface by dilated ducts.

The skin was removed by Mr. Liston; "the part cicatrised, and the nose regained the usual appearance."

2606. A hemispherical mass of hypertrophied integument, about 5 cm. in diameter, removed from the nose. It very closely resembles in appearance the specimen preserved in No. 2604. 3579

The mass was removed by Mr. Liston. "After the operation the nose regained its usual appearance. In the substance of the mass was a cyst, formed by dilatation of a sebaceous follicle, filled with inspissated secretion."

FRACTURES OF THE NOSE.

Specimens of these injuries are preserved in Nos. 139 to 141.

FOREIGN BODIES IN THE NASAL CAVITIES.

Foreign bodies are not uncommonly met with in the nasal cavities of children, in which their presence may for long periods have been unsuspected. They occasion ulceration of the mucous membrane resulting in a unilateral offensive blood-stained discharge. A foreign body may become gradually encrusted with calcareous matter and produce a rhinolith (2607).

2607. A rhinolith, slightly broken during extraction. It measures about 1·5 cm. in diameter and consists of a thin layer of phosphate and carbonate of lime deposited on a locust-bean. 6666

It was removed from the nose of a boy in whom it had been present for four years.

2608. A foreign body removed from the nose, in section. The cut surface is dense and brown in colour. The exact nature of the body is doubtful. 5988

The foreign body was removed from the inferior meatus of the nose of a girl aged 19, who had suffered from a nasal discharge since an attack of scarlet fever in childhood. A small piece of dead bone was removed at the same time and a complete cure ensued.

CHRONIC INFLAMMATION OF THE MUCOUS MEMBRANE OF THE NOSE.

The only forms of chronic inflammation of the nasal mucous membrane represented in the Museum are the simple hypertrophic and the polypoid.

Hypertrophic rhinitis is characterised by thickening of the mucous membrane covering the inferior turbinate bone. The hypertrophy may be general, but more commonly only the mucous membrane over one extremity of the bone, especially the anterior, is affected. In other instances changes occur in certain of the tissues of the mucous membrane resulting in the production of a hypertrophy the surface of which gradually assumes a moriform or mulberry-like appearance. This is frequently present at the posterior extremity of the inferior turbinate, and less commonly the mucous membrane covering the whole bone is thus transformed (2609, 2609 A).

Mucous polypi are the result of a chronic inflammation of the mucous membrane covering the ethmoidal regions of the nasal cavity. The subjacent bone and periosteum also show evidences of chronic inflammation, to which the changes in the mucous membrane are usually regarded as secondary. The first change observed in the formation of mucous polypi is a general swelling of the mucous membrane covering the regions of the middle meatus, and more especially that which is intimately associated with the uncinate process of the ethmoid and the concavity of the middle turbinate bone. As the swelling increases it gradually assumes a soft and œdematous appearance. The swelling then ceases to be uniform and small outgrowths occur, which by their gradual increase in size become transformed into typical mucous polypi. The latter present the following appearances : They are pedunculated and often very lobulated, and composed of a gelatinous semitranslucent substance with a smooth glistening surface, upon which minute blood-vessels can often be seen ; the colour is usually grey or greyish-yellow (2616). Mucous polypi may increase in size and number to such an extent as completely to fill and distend one or both nasal cavities and the naso-pharyngeal space (2611). They not infrequently become cystic, and if exposed to irritation in the naso-pharynx or anterior nares lose their pale gelatinous appearance and become more dense and vascular (2615). After removal nasal polypi quickly shrink if allowed to dry but swell up again when placed in water. Histologically, nasal polypi consist of a loose myxomatous connective tissue traversed by capillaries, which are in many places surrounded by collections of small round cells, the whole formation being evidently of inflammatory origin. When the polypus is small its surface is covered with ciliated epithelium, but under the influence of pressure and attrition this may be replaced by a stratified non-ciliated epithelium. Mucous glands are more or less numerous in the substance of nasal polypi, and may become distended into cysts of varying size. Mucous polypi are frequently found in association with chronic suppuration of the accessory nasal sinuses, especially when the fronto-ethmoidal cells are the seat of disease.

2609. An inferior turbinate bone, over the posterior part of which the mucous membrane is hypertrophied. The hypertrophy is most marked over the extremity of the bone, so that the whole part is club-shaped. Anteriorly the hypertrophy ceases abruptly at a point about 1 cm. from the extremity of the bone. The thickened mucous membrane is marked by narrow sharply-defined clefts giving to the surface a mulberry-like appearance. 10,047

From a patient under the care of Mr. Herbert Tilley. The turbinate bone was removed with a turbinotome.

2609 A. A right inferior turbinate bone removed by operation for hypertrophy of the mucous membrane. The hypertrophy affects chiefly the mucous membrane covering the lower border and outer concave surface. The mucous membrane covering the posterior extremity of the bone is marked off from the rest by a deep sulcus and presents a typical mulberry-like surface. In the rest of its extent the surface has a foliated appearance caused by fine parallel sulci. 10,112

From a patient under the care of Mr. Herbert Tilley.

2610. Four mucous polypi removed from the nose with forceps. The polypi are lobulated and the surface, which is formed by smooth mucous membrane, is cleft and pitted. The two upper polypi appear to have been attached by a narrow pedicle. 3821

2611. A long chain of mucous polypi removed from the nose with forceps. The individual polypi are lobulated, very smooth, and in the recent state presented a gelatinous appearance ; they are connected together by torn shreds of mucous membrane. At the middle of the specimen is a fragment of bone, probably from the middle turbinate. The large polypus which forms the lower end of the specimen differs from the rest by its rough slightly discoloured surface, due to inflammation. 6210

The polypi were removed by Mr. Heath with polypus-forceps.

2612. A large lobulated mucous polypus removed from the nose. It is laterally compressed, in conformity with the nasal cavity, and is covered with smooth mucous membrane. At the upper part is a rough surface which marks the situation of the pedicle of attachment. 534

From a patient under the care of Mr. Liston.

2613. An elongated polypus, which was extracted by forceps from the nose. It measures 4·5 cm. in length, and tapers gradually towards its attached end. It is covered by a thin mucous membrane, in some parts puckered, in others minutely reticulated from the cicatrisation of superficial ulcers. 3611

2614. A large nasal mucous polypus. The narrow upper extremity indicates the point of attachment. 8870

From a woman, aged 26, who was suffering from nasal obstruction. The polypus which blocked the posterior nares was attached to the posterior extremity of the middle turbinate bone. It was removed with a snare passed through the nose and adjusted around the pedicle of the polypus by a finger in the naso-pharynx.

2615. Three mucous polypi, together with a strip of the mucous membrane covering the middle turbinate bone from which they grew. The upper and largest polypus presents the characteristic gelatinous appearance; the other two are of a dull red colour, the result of chronic congestion. 9529

The polypi were removed with a wire snare. The large flattened polypus lay in the nasal cavity, but the two smaller ones projected into the naso-pharynx.

2616. A mucous polypus of the nose of unusually large size. It is flattened and of a somewhat quadrilateral shape, measuring about 7 cm. in length. The surface presents lobulated thickenings and the border is rounded. The point of attachment appears to have been small and situated at the upper end of the specimen. The polypus presents the usual yellowish-grey colour and semitranslucent appearance. 10,048

From a patient under the care of Mr. Herbert Tilley.

TUBERCULOUS DISEASE OF THE NASAL FOSSÆ.

Tuberculous disease of the nose may be primary, or secondary to tuberculous lesions elsewhere. The cartilaginous portion of the septum is most frequently attacked, and the lesion may take the form of a smooth or granular swelling, or an ulcer. The floor of the nose and the inferior turbinate are much less frequently the seat of the disease (2616 A). The interior of the nose is not uncommonly involved by the direct extension of lupus from the neighbouring skin.

2616 A. The anterior part of a left inferior turbinate bone, showing a small tuberculous ulcer. 10,113

Removed by Mr. Herbert Tilley from a woman, who was also suffering from tuberculous disease of the glands of the neck and the wrist-joint.

SYPHILITIC NECROSIS OF THE BONES OF THE NASAL FOSSÆ.

The specimens of syphilitic necrosis of the nose are preserved among the Diseases of the Bones (Nos. 591–594).

TUMOURS OF THE NASAL CAVITIES.

Papillomata, fibromata, angiomata, enchondromata, osteomata, and cysts are occasionally met with in the nasal cavities. Angioma most commonly occurs as the "bleeding polypus of the septum."

Primary sarcoma and carcinoma of the nasal cavities are rare. The nasal cavities are, however, frequently involved by malignant growths originating in the neighbouring parts, such as the antrum, orbit, and naso-pharynx.

2616 B. The anterior part of a left middle turbinate, showing simple cystic enlargement. 10,114

FIBROMA AND SARCOMA OF THE NASO-PHARYNX.

The most common tumour of the naso-pharynx is a fibroma growing from the periosteum of the base of the skull. Another specimen of this disease is preserved among Diseases of the Pharynx (No. 1525).

2617. A very large vascular fibrous tumour of the naso-pharynx and neighbouring parts, in fragments, removed by operation. Many of the fragments are lobulated and present a smooth surface covered with mucous membrane. A section which has been made into one of the largest fragments shows a dense homogeneous structure.

Microscopic Structure.—The tumour is a very vascular fibroma.

From a boy, aged 14, who was admitted into the Throat Hospital, Golden Square, under the care of Mr. Herbert Tilley, November 19, 1901, complaining of complete nasal obstruction with a blood-stained discharge from the left nostril, of 5 months' duration. Recently the discharge had been offensive, and the patient became weak and anæmic. The lower half of the nose was much broadened and the left nostril was distended by a grey sloughy mass which bled freely when touched; the right nostril was blocked by a deviation of the septum. By posterior rhinoscopy the left choana was seen to be filled by a reddish mass, which with the finger was felt to be smooth and elastic and seemed to spring from the basisphenoidal and ethmoidal regions. On November 20, 1901, an inverted U-shaped incision was made over the sides and root of the nose and the latter turned downwards, exposing the growth, which was partly removed with strong forceps. On December 7, after preliminary laryngotomy, the palate was completely divided in the middle line and the left half of the hard palate removed; the remainder of the growth was then apparently completely removed with snares, scissors, and cutting forceps. On March 15, 1902, a considerable recurrent growth was removed at a third operation identical with the second. During May, June, and July, a further recurrence was frequently treated with the galvano-cautery, but without success. On July 31, 1902, the nasal cavities and the left antrum were freely opened from within the mouth, and an extensive recurrent growth removed from the antrum and from the basisphenoidal and ethmoidal regions. Each operation was attended with very free hæmorrhage. At the beginning of 1903 the cleft in the soft palate was closed by operation. In 1905 the patient was in perfect health and there was no evidence of recurrence. (Tilley, Proc. Laryng. Soc. Lond. 1902.)

2618. Part of the bones surrounding the nasal fossæ, together with the tongue and larynx and the left ear, showing a large tumour of the naso-pharynx. The tumour, which is very lobulated, fills the left side of the naso-pharynx and has a wide base of attachment to the mucous membrane of the outer and upper walls of the naso-pharynx, extending forwards as far as the posterior nares and downwards as low as the tonsil with the upper part of which the growth is continuous. Anteriorly, the tumour is prolonged into each nasal cavity, but more extensively into the right than the left, the growth in the former situation reaching, in the form of an unattached process, for a distance of 2 cm. in front of the posterior border of the vomer. Externally the tumour forms a considerable mass in the zygomatic fossa, reaching as far as the styloid process. From the naso-pharynx the growth extends along the left Eustachian tube into the tympanum, and thence, after destroying the membrana tympani, has filled the external auditory meatus and projects from its outer end. 4072

From a female child, aged 5 years, who was under the care of Mr. Quain in U.C.H. in 1851. Portions of the growth were from time to time removed with polypus forceps in order to give relief. The child became much emaciated, and died from asphyxia and inanition.

2619. A sarcoma of the naso-pharynx, together with the left superior maxilla which was excised as a preliminary step in the operation for removal of the tumour. The tumour has an irregularly quadrilateral form, measuring 5·5 cm. by 4·5 cm., and 3 cm. in thickness; it has in most parts a smooth, slightly lobulated surface; it is in some parts discoloured by hæmorrhage. At the upper extremity of the tumour is the narrow surface by which it was attached to the roof of the pharynx. The posterior part of the jaw has been expanded laterally by the extension of the tumour into the nasal cavity. 9607

Microscopic Structure.—The tumour is a round-cell sarcoma.

From a girl, aged 14, who was admitted into U.C.H. under the care of Mr. Godlee, June 1, 1904, with symptoms of a nasal obstruction of 6 months' duration. Before her admission to the hospital a "polypus" had been removed from the nose, and on a subsequent occasion an operation was performed for "a growth at the back of the nose." Two days before admission a painful swelling formed below the left eye. On admission there was an acute inflammatory swelling over the lower margin of the left orbit, the left eye was displaced upwards and outwards and there was diplopia; both nostrils were blocked, the left completely; there was occasional epistaxis from the left nostril, in which a soft mass of growth could be seen; a tumour could be felt in the naso-pharynx. An incision was made below the left orbit and pus was evacuated with rapid relief of the pain and swelling. On June 21 the left upper jaw was excised and the tumour of the naso-pharynx thus freely exposed; the attachment of the tumour to the base of the skull was divided with a gouge. The patient did well and left the hospital on July 8. (Mr. Godlee's *Case-books*, 1904, Mordecai.)

Diseases of the Accessory Sinuses of the Nose.

Chronic suppuration of the accessory sinuses of the nose usually arises by direct extension of inflammation and infection from the mucous membrane lining the nasal cavity. The micro-organisms directly productive of the inflammation are various, but influenza is a common cause of empyema of the accessory nasal sinuses. The maxillary sinus is frequently infected by the discharge of septic matter arising in connection with the roots of diseased upper teeth. In most cases the natural communication between the affected cavity and the nasal fossa remains patent, and the most prominent symptom is a purulent nasal discharge, which is often intermittent and sometimes offensive. The irritation of the discharge often causes a swollen or polypoid condition of the mucous membrane in the neighbourhood of the middle meatus. In long standing cases the mucous membrane lining the diseased sinus becomes thickened and often polypoid. The symptoms and results of suppuration in the different sinuses depend upon the situation and relations of the cavity affected.

2620. A right superior maxilla, the orbital wall of which has been removed, so as to open the antrum. Within the antrum is a long pyriform polypus, resembling in its general characters those found in the nasal cavity. It is attached by a narrow pedicle to the posterior part of the space at the junction of the posterior and inner walls. 5424

From a subject in the dissecting-room.

2621. A calvaria showing the results of diffuse suppuration of the bone, following suppuration of the frontal sinus. In the left half of the frontal bone is part of an irregular opening resulting from an operation on the frontal sinus. The opening has a transverse measurement at its lower part of 2·5 cm., and its edges have in most parts become smoothly rounded. The posterior wall of the left frontal sinus is wanting over a still larger area, and is chiefly represented by two fragments of bone adherent to the dura mater which have become drawn backwards in the process of drying. Between the tables of the frontal bone around the opening above described, apertures lead into the remains of the two frontal sinuses, the upper limits of which cannot be defined as the cavities have been thrown open into the surrounding diploë. A separate small opening leads through the outer table of the frontal bone in its right half into the upper part of the subjacent sinus.

In the remaining part of the calvaria, the only parts which have escaped the destructive inflammation are irregular portions of the squamous and adjacent parts of the parietal bones and a narrow strip of the right parietal behind the coronal suture. In the rest of their extent the bones are either wanting and only the dura mater remains, or are represented by large, incompletely detached sequestra. These sequestra, which are best illustrated by those of the upper part of the parietal bones, form thin irregular plates, extensively pitted and perforated; they remain attached to the surrounding bone only by narrow irregular bridges. 10,049

From a woman, aged 22, who was under the care of Mr. Herbert Tilley in the London Throat Hospital. She suffered from almost complete bilateral nasal obstruction, with purulent discharge from the nostrils and into the throat. During a period of 3 months numerous operations for mucous polypi were performed, but the discharge of pus continued. The maxillary antra were explored with almost negative result, and it was therefore concluded that the frontal sinuses, and probably the ethmoidal cells, were the seat of disease. Separate operations were performed on the two frontal sinuses, both of which contained pus with large polypoid granulations. About a week later a subperiosteal abscess was opened over the lower median part of the frontal bone. Subsequently numerous similar abscesses occurred in different parts of the frontal and parietal bones, so that eventually the anterior part of the scalp was almost entirely undermined and from time to time large sequestra of the skull exfoliated. Finally, in the hope of checking the spread of the inflammation, a transverse incision was made across the scalp from ear to ear behind the œdematous area, but without success. Death occurred at the end of about 9 months. The pus from the abscesses contained streptococci. At the *post mortem* examination, ten small abscesses were found in the cerebrum; there was pus around the cavernous and lateral sinuses, between both petrous bones and the dura mater, and in the hypophysis; there was also an abscess around the left Eustachian tube extending to the pharynx and another in the base of each lung. (Tilley, B. M. J. 1899, vol. ii, p. 994.)

INJURIES AND DISEASES OF THE EAR.

Foreign Bodies in the Ear.

Foreign bodies introduced into the external auditory meatus may remain for long periods without causing irritation, but in some instances the foreign body or improper attempts to remove it may lead to injury of the membrane and disease of the tympanum.

Exostosis of the External Auditory Meatus.

2622. Two small exostoses removed from the external auditory meatus. They are composed of dense ivory-like bone. 8481

From a man, aged 40, under the care of Mr. Godlee. The meatus was blocked by the bony outgrowths, which had remained unchanged in size for many years. There was suppuration in the middle ear. The growths were exposed by an incision behind the pinna, and removed with a chisel after drilling the bone with a dental engine.

Chronic Suppuration in the Middle Ear and its Complications.

The various local complications of suppuration in the middle ear are met with most frequently in chronic cases. The complications can only be elucidated by a careful consideration of the relation of the tympanum to the neighbouring structures—mastoid antrum, aqueduct of Fallopius, labyrinth and semicircular canals, carotid canal, temporo-maxillary articulation, lateral sinus, and the brain and its membranes. The liability to the extension of the inflammation to one or another of these structures is increased by the occurrence of caries or necrosis of the bony wall of the tympanum, or by the presence of any obstruction to the escape of the discharges from the external meatus, such as is caused by granulation polypi.

Suppuration in the mastoid antrum is the most common complication of middle ear disease. The cavity of the antrum, with which in the adult the mastoid cells communicate posteriorly, opens at its upper and anterior part into the attic of the tympanum; the position of the opening is thus not favourably placed for the free escape of discharges from the antrum into the tympanum. When an abscess in the antrum perforates the outer wall of the cavity, the seat of the perforation is usually immediately behind the upper and posterior part of the external auditory meatus (2623) and this spot is selected in opening the cavity by operation (2631). In performing the latter operation, if the opening be made to extend above the supramastoid crest the dura mater of the middle fossa will be exposed; if the opening be made too far posteriorly the lateral sulcus will be opened; and lastly, in removing the bony septum between the antrum and the tympanum it must be remembered that the facial nerve lies on the inner aspect of the aperture between the two cavities.

From the tympanum the disease may extend through the thin plate of bone (tegmen tympani) which forms its roof (2624) or a similar extension may occur from the mastoid antrum; a considerable erosion in the bone may thus be produced and may cause suppuration between the bone and dura mater—*extradural abscess.* In these circumstances the dura itself often presents a rough and inflamed surface in the situation of the perforation in the subjacent bone (2633), and by further extension a cerebral abscess may result.

From the mastoid antrum the inflammation can readily extend through the osseous tissue which separates it from the lateral sulcus (2627), and granulation tissue or an actual abscess may be found around the sinus. The latter may thus become infected and filled by a softening thrombus—*septic phlebitis of the lateral sinus* (2633). The inflammation readily spreads from the lateral sinus to the other sinuses and to the jugular vein and is a common cause of *pyæmia. Meningitis* is an occasional, but very fatal, complication; it may be localised to the parts about the base of the brain or diffuse (2633).

Abscess of the brain, secondary to chronic suppuration in the tympanum, is most commonly met with in the hemisphere of the cerebellum (2628–2630) or in the temporal lobe of the cerebrum (2632, 2634). In many cases no direct connection can be traced with the naked eye between the disease in the temporal bone and the abscess in the brain. In other cases the path of infection can readily be traced; thus, in some instances, an erosion of the roof of the tympanum leads directly through the dura mater into the substance of the temporal lobe, whilst in other cases the disease extends by way of the antrum into the lateral sulcus, and thence directly through the dura mater below the tentorium into the adjacent part of the cerebellum (2628).

The paths by which pathogenic organisms may reach the interior of the cranium and cause one or another of the above-mentioned complications are the following: (1) caries of the tympanum, antrum, or labyrinth; (2) vascular or lymphatic channels distributed between the middle ear and the interior of the cranium; (3) fibrous trabeculæ connecting the dura mater and the mucous membrane of the middle ear; (4) an unossified petro-squamous fissure; (5) the sheath of the auditory or facial nerve.

Among the other occasional complications of suppuration in the tympanum which can readily be understood by a consideration of the anatomical relations of the cavity, are facial paralysis, destruction of the internal ear, erosion of the carotid artery, and disease of the temporo-maxillary joint (2626).

2623. Part of a left temporal bone showing certain changes resulting from chronic suppuration in the middle ear. The cavities of the tympanum and mastoid antrum have been opened up by the removal of their roof. The bony wall between the tympanum and labyrinth has been destroyed. The mastoid antrum is enlarged as the result of chronic suppuration, and opens externally immediately above and behind the external auditory meatus by a nearly circular aperture, 5 mm. in diameter, with smooth rounded edges. The labyrinth communicates with the carotid canal by an opening 2 mm. in diameter. 10,005

It is important to observe that the opening, by which the pus in the mastoid antrum has discharged externally, is in the exact position selected in the operation for opening the cavity.

2624. Part of the left temporal bone of a young subject, showing considerable destructive changes resulting from chronic suppuration in the middle ear. The cavities of the tympanum and mastoid antrum form a single irregular excavation which is widely open externally and through its roof communicates with the middle fossa of the skull by an elongated opening, 1·5 cm. in length, in the line of the petro-squamous suture. The bone around the latter opening has been rarefied by inflammation. From the posterior part of the cavity formed by the enlarged mastoid antrum a small perforation leads through the anterior wall of the lateral sulcus. 10,007

2625. Part of the right side of a skull including the greater part of the temporal bone, showing very extensive destructive changes resulting from chronic suppuration in the middle ear. The cavity of the tympanum is enlarged and its wall is in most parts carious; from the cavity irregular perforations lead inferiorly into the carotid canal, and superiorly through the roof into the middle fossa of the skull. The disease has extended into the mastoid process causing extensive caries of the surrounding bone and leaving only part of the outer wall of the process intact; from this region irregular carious openings extend through the wall of the lateral sulcus and into the jugular fossa. The stapes remains in its normal position. 10,008

The disease of the ear was "of some months' standing." The very extensive caries of the bone around the tympanum suggests that the disease may have been tuberculous.

2626. Part of the right temporal bone from a case of chronic suppuration in the middle ear in a child. The tympanum and mastoid antrum have been opened from above. The cavity of the tympanum is enlarged and its walls rarefied. An oval opening, 4 mm. in diameter, passes from the external auditory meatus into the temporo-maxillary articulation, through the tympanic plate. The mastoid antrum is enlarged and the bone around it carious. The external surface of the bone in the position of the antrum is rarefied by inflammation. 10,009

This and the three preceding specimens were presented by Mr. A. E. Barker.

2627. Part of the left side of a skull including the greater part of the temporal bone, showing extensive disease of the mastoid antrum resulting from chronic suppuration in the middle ear. The interior of the mastoid process is entirely excavated, the antrum and mastoid cells forming a single cavity with a vertical measurement of nearly 3 cm. and extending downwards to the apex of the mastoid process; it has been widely opened by operation. Anteriorly the cavity is bounded by the posterior wall of the bony meatus which has not been removed, and at the upper part the opening between the antrum and tympanum is marked by a piece of wire. The roof of the cavity formed by the enlarged antrum is intact, but posteriorly an irregular opening measuring nearly 2 cm. in its greatest diameter leads from the antrum into the lateral sulcus; the edges of the opening are thin and sharp, and the surrounding surface presents a thin deposit of new bone. 8133

From a woman, aged 32, who five weeks before her admission into U. C. H. was in bed for a fortnight with "blood-poisoning and shivering." She then improved, but noticed a painful swelling on the left side of the head, which proved to be an abscess and was opened four or five days before her admission to the hospital. On admission there was pain in the left side of the head and a profuse discharge of fetid pus from the left ear and from a small opening in the skin over the mastoid. The temperature was 102·4°, and pulse 136. There was no glandular enlargement in the neck, and no tenderness along the jugular vein. The cavity of the antrum was freely opened by operation; it contained excessively foul pus and posteriorly, where the bony wall was deficient, pulsation could be felt. Irregular fever persisted after the operation, embarrased breathing and cough supervened and the patient died on the 6th day. There was septic phlebitis with softening coagula in the occipital sinus, which was as large as the little finger, also in both lateral sinuses and in the internal jugular vein on each side as low as the entry of the common facial. The dura mater over the opening in the wall of the left lateral sulcus was inflamed, and the corresponding part of the surface of the left hemisphere of the cerebellum was also inflamed and adherent; there was no other evidence of meningitis or of abscess in the brain. There was recent pleurisy on both sides with numerous embolic abscesses in the lungs; the spleen was large and very soft; the other organs were normal. (Surg. Reg. Rep. 1898, p. 226.)

2628. A cerebellum showing an abscess in the left hemisphere, resulting from chronic suppuration in the left tympanum and mastoid antrum; the cerebellum has been divided by a horizontal section. The collapsed abscess cavity in the left hemisphere can be readily recognised on the surface of the section; the cavity is surrounded by inflamed brain-tissue, the surface of which is discoloured in the position from which a hernia cerebelli had been removed. 7395

From a girl, aged 14, who was under the care of Sir Victor Horsley in U. C. H. in 1895. There had been a discharge from the left ear for 6 years, following scarlet fever. Three days before admission the child felt ill and the ear was painful, and the next day vomiting began. On admission the patient was very drowsy, vomited frequently, and complained of pain in the occipital region and neck; there was tenderness with œdema over the left mastoid; there was no optic neuritis or other evidence of cerebral complication. The mastoid antrum was opened and found to contain pus: by a further removal of bone it was found that the suppuration had extended into the lateral sulcus; the sinus, which was thrombosed, was ligatured in two places and divided; the dura mater covering the adjacent part of the cerebellum was swollen and yellow, and an abscess, containing about an ounce of offensive pus, was opened in the cerebellum and drained. The operation was followed by hernia of the cerebellum which was cut away on two occasions and a further collection of pus evacuated. Death occurred on the 21st day. No other complications were found at the *post mortem* examination. (Surg. Reg. Rep. 1895, p. 108.)

2629, 2630. A series of vertical sections of the right hemisphere of a cerebellum in which a large abscess, secondary to chronic suppuration in the ear, is present. The abscess cavity, which had been opened during life, has almost completely collapsed and can only be recognised in the sections as a horizontal cleft in the substance of the hemisphere. In two of the sections which have been taken nearest to the middle line, the abscess is seen to extend forward nearly to the floor of the fourth ventricle. 8901

From a girl, aged 14, who was admitted into U. C. H. under the care of Mr. Barker, Dec. 14, 1901. She had suffered from suppuration in the right middle ear since scarlet fever 3 months previously. A fortnight before admission there was severe pain in the ear with intermission of the discharge, and a week later the patient began to suffer from extreme weakness and vomiting; during the three days before admission four rigors had occurred. On admission the patient was pale and wasted, drowsy and restless; there was occipital headache; there was no paralysis or optic neuritis; the pulse was 66 and the temperature 99°; there was well defined tenderness with some induration along the line of the right internal jugular vein. The diagnosis of intracranial abscess with thrombosis of the lateral sinus was made. On the following day immediately after the patient had been removed to the operating theatre, but before the administration of the anæsthetic had been commenced, respiration ceased and the patient became livid, whilst the heart continued to beat strongly and rapidly. Artificial respiration, with administration of oxygen, was kept up for an hour and a half without natural respiration being re-established, the heart continuing to beat regularly. The skull was opened with a small trephine over the temporal lobe and the brain punctured with negative result. The operation was then repeated over the cerebellum and some foul pus evacuated with a hollow needle. Artificial respiration was still continued but without success, the heart continuing to beat for 2¼ hours after natural breathing had ceased. In addition to the abscess in the cerebellum there was a softening clot in the right lateral sinus and jugular vein; there were no abscesses in the viscera. (Barker, Clin. Soc. Trans. vol. xxxv. 1902, p. 117.)

2631. Part of the right side of a skull including portions of the temporal, parietal and occipital bones, from a case of chronic suppuration in the middle ear. The mastoid antrum has been opened externally by operation and made to communicate freely with the tympanum by the partial removal of the bone between them. An irregular opening, 1·5 cm. in its longest diameter, is present in the roof of the tympanum and external auditory meatus. Three trephine-holes are present; one in the squamous portion of the temporal and two in the parietal bone (see No. 2632). 6768

2632. The right half of the cerebrum from the same case as the preceding specimen. Almost the whole of the temporal lobe is excavated into a large abscess-cavity. 6768

From a woman, aged 38, who was under the care of Dr. Bastian and Sir Victor Horsley in September, 1891. There had been discharge from the right ear, with pain and deafness, since an attack of influenza four months before admission. After temporary improvement the symptoms recurred with frequent vomiting without nausea. Three weeks before admission it was noticed that the face was "drawn over," and a week later the left side of the body was noticed to be weak, but the patient was able to walk with assistance till 5 days before admission. On the 4th day before admission she became drowsy and delirious. On admission the patient was semi-comatose; there was a foul discharge from the right ear; there was paralysis of the left side of the face with conjugate deviation of the head and eyes to the right, the left arm was completely and the left leg partially paralysed; there was double optic neuritis. Operation was performed on the day after admission; the temporal lobe was explored through the largest trephine-opening shown in the last specimen, an abscess was found and the anterior trephine-opening made to provide more efficient drainage. Two days later the mastoid antrum was opened, and three days later another trephine-opening was made posteriorly as the drainage of the cerebral abscess was unsatisfactory. Death occurred on the 8th day after the first operation. No other complications were found at the *post mortem* examination.

2633. Parts of the two sides of the skull including the greater portion of the temporal bones, from a case of chronic suppuration of the middle ears. On the *left* side the mastoid antrum has been freely opened by the removal of its outer wall; the cavity of the antrum is small. Viewed from the cerebral surface, the thin plate of bone which forms the roof of the tympanum is seen to be slightly discoloured. An opening has been made in the skull behind the mastoid antrum in order to explore the lateral sinus. On the *right* side the mastoid antrum has been opened *post mortem*; it is small and deeply seated and contained pus; the outer wall of the communication between the antrum and the tympanum has not been removed. The roof of the tympanum is the seat of a perforation, 4 mm. in diameter; pieces of wire have been passed from the perforation into the tympanum and mastoid antrum. The outer surface of the dura mater, which has been reflected from the petrous portion of the petrous bone, is roughened by inflammation, and the lateral sinus is inflamed. 8157

From a man, aged 27, who was admitted into U. C. H. in 1898. He had been deaf all his life and there was discharge from both ears. During the 9 days preceding admission the patient had suffered from severe headache followed by vomiting. On admission the patient was drowsy, the temperature rose from 101°·6 to 104°·6; the pulse was slow and full; there was slight paresis of the left side of the face; there was no optic neuritis. Both tympanic membranes were perforated; the left ear only was discharging; there was no evidence of suppuration in either mastoid antrum. A rigor occurred during the night after admission. On the following day the left antrum and left lateral sinus were explored but showed no sign of disease; on the second day the patient became comatose and died after a convulsive attack. There was diffuse basic meningitis; the right lateral sinus was filled with softened coagulum, which extended into the upper two inches of the internal jugular vein. The intracranial suppuration had resulted from the perforation in the roof of the tympanum. (Surg. Reg. Rep. 1898, p. 222, No. 2505.)

2634. The right half of the brain from a case of chronic suppuration of the middle ear, showing a large abscess in the posterior part of the temporal lobe. In the recent state the abscess was nearly as large as a hen's egg. 9965

From a girl, aged 15, who was admitted into U. C. H. on August 1, 1905, under the care of Mr. Raymond Johnson. There was a history of discharge from both ears, that from the right being more profuse and of three years' duration. During the 14 days before admission the patient had suffered from headache and a few days later vomited. On admission there was severe frontal headache with slight drowsiness; the temperature was 101°·6, pulse 56; there was a purulent discharge from the right ear and a perforation without discharge in the left membrane. On the day after admission the right mastoid antrum was opened and found to contain pus. For several days the patient was much better, the temperature varying between normal and 100°, and the pulse between 60 and 80. On Aug. 7 double optic neuritis, most marked on the left side, was first detected, and there was weakness of the left external rectus and very slight weakness of the lower part of the right side of the face. The headache returned and was most marked in the right frontal region. On Aug. 11 the left mastoid antrum, the left temporal lobe, and left hemisphere of the cerebellum were explored with negative result. Death occurred suddenly during the following night. (Mr. Godlee's *Case-books*, 1905, Burton.)

2635. Two slices of the right side of the brain including parts of the parietal and temporal lobes, from a case in which an abscess, secondary to chronic suppuration in the middle ear, had been successfully treated by operation, two and a half years before death. The probable situation of the abscess is indicated in the sections by pieces of bristle. In the area indicated there is a small deposit of fibrous tissue in the temporal lobe, and in the corresponding position the under surface of the lobe presents a slight contraction. The brain substance in the affected area presents a narrow line of orange pigmentation. 6759

From a man, aged 33, who was admitted into U. C. H. under the care of Mr. Barker on Jan. 21, 1888. He had suffered from occasional discharge from the right ear since an attack of scarlet fever at the age of 7 years. During the three weeks before admission the patient had suffered from pain in the right side of the head, and the day before admission he vomited twice. On the second day after admission two epileptiform seizures, chiefly affecting the right ride of the body, occurred. On the fourth day the right mastoid antrum was opened, but was not diseased. Slight elevation of temperature persisted; the patient became drowsy and lost flesh; slight weakness of the left side of the face developed. On the 12th day weakness of the left arm was first observed and the paresis of the left side of the face was more marked; there was no optic neuritis. On the 13th day the skull was trephined in three places and an abscess excavated, which appeared to be situated in the region of the right Sylvian fissure. The patient made an uninterrupted recovery and left the hospital on March 8. (Barker, B. M. J. 1888, vol. i, p 777.) The patient subsequently returned to his work and remained in good health. In 1891 he contracted influenza followed by hæmoptysis. Death occurred Sept. 3, 1891.

Tuberculous Disease of the Middle Ear.

Tuberculous disease of the middle ear is not uncommon, especially in children, and is characterised by suppuration of painless onset, painless destruction of the membrana tympani, frequent occurrence of facial paralysis and enlargement of the periotic lymphatic glands. These symptoms are commonly associated with extensive destruction of the surrounding bone. The cavity of the middle ear may thus be greatly enlarged and filled with exuberant granulations extending through the perforated tympanic membrane into the meatus. The disease is nearly always secondary to tuberculous lesions elsewhere. and in young children frequently arises by direct extension from diseased lymphoid tissue in the naso-pharynx.

Carcinoma of the Ear.

Carcinoma of the squamous-cell variety occasionally occurs primarily in the middle ear or external auditory meatus.

INJURIES AND DISEASES OF THE EYE.*

INJURIES OF THE EYE.

NON-PENETRATING INJURIES.

Among the chief *immediate results* of non-penetrating injuries of the eyeball are:—Hæmorrhage under the conjunctiva (2636); hæmorrhage into the anterior chamber; detachment of the iris; rupture of the ciliary muscle; hæmorrhage into the vitreous from the ciliary body, choroid or retina; rupture of the suspensory ligament of the lens, with partial or complete displacement of the latter forwards, backwards or laterally; and rupture of the choroid or retina.

Among the *remote results* of non-penetrating injuries are:—Rupture of the lens capsule at the equator or posterior pole (traumatic cataract); shrinkage of the vitreous from formation of new tissue, which may undergo calcification; detachment of the retina (2638) with or without cystic formation (2638); and calcareous degeneration of the lens (2638).

In *Rupture of the Globe* resulting from a non-penetrating injury the rupture is nearly always situated about 2 mm. above and behind the corneo-scleral margin. The conjunctiva is usually uninjured and some of the contents of the globe, such as the lens, iris or ciliary body, may escape through the rent in the sclerotic and be visible through the intact conjunctiva.

2636. A right eyeball with the ocular conjunctiva and parts of the lids. Beneath the outer part of the ocular conjunctiva is a brown discoloration, the result of hæmorrhage; the conjunctiva is slightly raised. 6451

The hæmorrhage was caused during a fit of severe vomiting.

2637. Half an eyeball. The anterior chamber is deep; the iris is adherent to the lens (posterior synechia); the lens is small and the retina is completely detached. 7386

The eye was struck with a potatoe 12 years before removal.

/ **2638.** Half an eyeball. The iris is adherent to the lens at its pupillary margin, and to the cornea at its periphery. The lens is small and calcareous. The retina is almost completely detached, but still remains attached on one side of the optic nerve. The detached retina shows two small cysts. The optic nerve is cupped. 7459

The eye was injured some years before excision. The cupping of the optic nerve is due to increased intraocular tension, resulting from the adhesion of the iris to the lens and to the periphery of the cornea.

PENETRATING INJURIES OF THE EYE.

A. *Penetrating wounds, without retention of a foreign body.*—In penetrating wounds of the cornea some of the aqueous necessarily escapes; the wound may heal without further complication, but commonly the iris, being in contact with the wound, becomes adherent to it, and should this adhesion become permanent an anterior synechia results (2642); in a similar way the lens-capsule may become adherent to the wound. More commonly the iris prolapses through the wound at the time of the injury and, unless the prolapsed part be removed, it will become firmly adherent to the cornea during the process of healing. Should the penetrating wound involve the lens-capsule, some of the lens matter may escape into the anterior chamber; subsequently the lens may become opaque (2641, 2647) and ultimately undergo partial or complete absorption or calcification (2653). Penetrating wounds of the sclera may be followed by prolapse of the vitreous, iris, ciliary body, choroid or retina according to the site of the wound (2648). Scleral wounds frequently heal with a good deal of puckering.

---

* This section has been arranged and described by Mr. Percy Flemming, Professor of Ophthalmic Medicine and Surgery in University College.

In penetrating wounds of the eye blood may be found in the anterior chamber (2643), in the vitreous (2651), under the retina or choroid (2640), or in the substance of the retina or choroid.

Suppuration following a penetrating injury may be due to the direct introduction of infective material, or the wound may become infected secondarily from a mucocele (2639) or from the conjunctival sac. Pus may accumulate in the anterior chamber forming a hypopyon (2639) or in the vitreous (2641).

The inflammation resulting from a penetrating injury may be plastic in character, and when affecting the anterior part of the uveal tract is the cause of sympathetic inflammation in the other eye (2645). The plastic inflammation is not infrequently followed by the formation of a membranous layer of connective tissue behind the lens, which as it contracts may cause a complete (2649) or partial detachment of the retina. When the detachment is complete the retina assumes the shape of an umbrella, remaining attached only at the disc and ora serrata. In old standing cases the detached retina may be reduced almost to a thread. In rare cases the plastic inflammation may result in bone formation. Secondary glaucoma following penetrating wounds of the eye is illustrated in Nos. 2664, 2666, 2667, and staphyloma of the cornea in No. 2685.

B. *Penetrating wounds with retention of a foreign body.*—The most common foreign body found within the globe is a fragment of steel, but pieces of stone, glass, &c., are also met with. The presence of a foreign body in the globe may cause plastic irido-cyclitis, which may be followed by a sympathetic ophthalmitis in the opposite eye; less commonly the whole eyeball may suppurate (panophthalmitis). In other cases a foreign body may become encapsuled and remain in the eye without producing irritation; it may be situated in the vitreous usually at its lower part near the ciliary body, in the lens, or in one of the coats of the eyeball. In exceptional cases the foreign body, after striking one part of the inner surface of the eyeball, may rebound towards another part or leave the globe through a second perforation.

2639. Half an eyeball, altered in shape in the preparation of the specimen. There is an exudate in the anterior chamber (hypopyon) and also in the anterior part of the vitreous adjacent to the ciliary body and extending backwards at its lower part. The choroid vessels are engorged. The corneal wound is not recognisable. 8031

The cornea was punctured by a thorn and the wound subsequently became infected from the lachrymal sac which was distended and contained muco-pus. The anterior chamber was evacuated on two occasions before removal of the eye.

2640. Half an eyeball in horizontal section. There is a scar in the cornea running upwards from the lower corneo-scleral margin and seen in the section at the junction of the inner and middle thirds of the cornea. The inner part of the iris is absent and a fold of retina is adherent to the wound. There is hæmorrhage into the vitreous and between the choroid and retina, which is detached. The globe is partially collapsed. 7469

The globe was injured with scissors. The wound was freed of prolapsed iris; the eye was subsequently excised.

2641. A section of an eyeball, showing pus in the anterior chamber, pupil, and throughout the vitreous. The lens is becoming opaque and is displaced backwards. The wound is not recognisable. 7462

The eye was wounded with a piece of wire 11 days before excision.

2642. A vertical section of an eyeball, showing a small scar in the cornea at the junction of its middle and lower thirds, to which the iris is adherent. There is a blood clot adherent to the lower part of the ciliary body and projecting into the vitreous. The lens is absent. 8154

The eye was wounded with a packing needle which penetrated the cornea and lens; it was excised on account of persistent irritation.

2643. A section of an eyeball. There is a scar at the corneo-scleral junction. The retina is completely detached and drawn towards and adherent to the scar. The anterior chamber is deep and contains blood (hyphæma); there is also hæmorrhage around the lens and between the choroid and sclerotic, causing a general detachment of the former, most marked anteriorly. 6467

There is no history to the specimen.

2644. A section of an eyeball, showing a wound of the cornea at a junction of its middle and lower thirds. The anterior chamber is obliterated. The iris is in contact with the cornea and its lower part is in contact with the wound. The lens is wounded and becoming opaque, and there is exudate in the vitreous. 8030

The eye was wounded with a garden-fork. There was prolapse of the iris through the wound. The prolapse was removed, but the eye became more inflamed and was excised 3 days after the injury.

2645. A section of an eyeball. At the upper corneo-scleral margin is a wound of the cornea. The anterior chamber is deep and there is exudation on the anterior surface of the iris and in the pupillary area. There is a mass of exudation in the vitreous which, anteriorly, covers the inner surface of the ciliary body. The retina is detached, probably in the preparation of the specimen. 6468

There is no history to the specimen.

2646. A section of an eyeball, showing a wound of the cornea at its lower and outer part, but not visible on the cut surface. The cornea is opaque. The iris is adherent to the wound and in contact, though not adherent, to the cornea. The vitreous is full of purulent exudation. 6469

There is no history to the specimen.

2647. A section of an eyeball, showing a healed wound at the lower margin of the cornea. The lower portion of the iris has been removed and the stump is adherent to the scar. The lens is opaque and there is complete detachment of the retina, probably from shrinking of the vitreous. The sclerotic is thick, especially in its posterior part. 7386

The eye was wounded with a stone three months previously.

2648. An eyeball in equatorial section. There is a scar running outwards from the centre of the cornea, involving the corneo-scleral margin. The retina is detached and drawn in towards the scar. There is exudation in the vitreous, between the retina and choroid, and also between the choroid and sclerotic causing a detachment of the former. 6468

From a man, aged 59, whose eye was injured by a splinter while chopping wood. Three weeks later the eye was very painful and sympathetic inflammation present in the other eye.

2649. A section of an eyeball. There is a linear scar in the cornea running upwards from the corneo-scleral margin. The cornea is much thickened in the neighbourhood of the wound, and running backwards from it is a band of cicatricial tissue. This band passes through the pupil to the margins of which it is adherent and through the lens, ending on its posterior surface. The vitreous is replaced by blood-clot and exudate, and the retina is completely detached. The lens is opaque. 6466

There is no history to the specimen.

✓ **2650.** A section of an eyeball showing the results of an old injury. The pupil is occluded by a fine membrane; the margins of the pupil are adherent to the lens. There is a dense linear opacity in the anterior cortex opposite the pupil. The retina is completely detached and folded, forming a rounded band running from the optic disc and spreading out at the ora serrata. There is a band running from the choroid to the outer surface of the retina, anteriorly. 7386

The eye was wounded with a fork 6 years previous to excision. For several months the eye was painful but subsequently gave no trouble. During the last 6 months the opposite eye became very readily tired and liable to recurring attacks of hazy vision.

2651. A section of an eyeball showing a wound in the centre of the cornea. The cornea is in contact with the remains of the lens. The iris is wanting above. The vitreous is the seat of extensive hæmorrhage. The lower half of the retina and a smaller portion above the optic nerve entrance are detached. 7386

The eye was struck with a piece of steel wire which was removed a week later, upward iridectomy. The eye was excised one month after the injury.

2652. A section of an eyeball showing the results of a previous injury. The anterior chamber is deep at the centre and shallow at the periphery and has its angle obliterated. The margin of the pupil is completely adherent to the lens (ring synechia); between the ciliary and the pupillary attachments the iris is bulged forwards (iris bombé). There is complete detachment of the retina on the surface of which are pigmented spots, the remains of a previous vitreous hæmorrhage. 7386

The eye was injured with a twig a year previous to excision. The eye became inflamed and painful 3 months before excision. There was no obvious inflammation in the opposite eye.

✓ **2653.** A section of an eyeball showing the remote effects of a previous injury. The cornea is much thickened and opaque; the iris is in contact with the posterior surface of the cornea; the lens is opaque and calcareous in its anterior part. The vitreous chamber is filled with organised inflammatory material in which some cysts have formed. The retina and choroid are detached in places. The sclerotic is much thickened. 7460

There is no history to the specimen.

2654. Half an eyeball disorganised and shrunken, probably as the result of previous injury. The whole globe is shrunken; the cornea and sclerotic are very thick, and the latter puckered. The lens is calcareous: the vitreous is shrunken and contains two small calcareous fragments. 6473

2655. Half an eyeball disorganised and skrunken, probably as the result of previous injury. The cornea is opaque and the lens degenerated. The retina is detached. There are thick plates of bone in the substance of the choroid, and on the inner surface of these is a mass of organised exudate. 6124

2656. Half an eyeball disorganised and shrunken as the result of injuries inflicted twenty years previously. The globe is small and the sclerotic thickened; the cornea is opaque and the iris adherent to the back of the cornea and to the lens capsule; the lens itself is not recognisable. The retina is completely detached. A bony shell has developed in the choroid. 7474

2657. Half a shrunken eyeball excised on account of pain. The globe is shrunken and disorganised; the cornea is thickened and opaque. In the lower part of the ciliary region there is a depressed linear scar. The lens is in contact with the cornea; the sclerotic is much thickened and puckered and separated from the choroid by a space occupied by coagulated material. The retina cannot be distinguished. 8390

The eye had received a penetrating injury many years before.

2658. Two halves of a shrunken eyeball, in one of which the cornea and sclerotic have been removed. The globe is small and the coats thickened. Irregular plates of bone have been formed in the choroid. The lens has almost completely disappeared, and behind the remains of it is a bony plate touching the ciliary body at its periphery. 7356

The eye was injured with scissors at the age of five, 21 years before excision.

2659. Half an eyeball. A scar is present in the cornea near its margin, to which the iris is attached by broad adhesions (anterior synechiæ). The anterior chamber is deep. The lens is partially shrunken and opaque. Lying on and embedded in the posterior part of the ciliary body is a foreign body, surrounded by plastic exudation, rounded in form, and measuring about 2 mm. across. 7386

Six months previously to excision the eye was struck with a projectile. There had been three attacks of inflammation of the eye since, the last, three days previously to excision. Spots of keratitis punctata could be seen at the lower part of the cornea.

2660. Half an eyeball. At the level of the section just above and behind the lens, and lying on the ciliary body, are several minute fragments of iron. The retina has been removed. The choroid has a rusty colour. 7498

The eye was struck with a chip of iron 16 months previously to excision; it became painful and inflamed a few weeks prior to its removal.

Burns and Scalds of the Eyeball.

Burns or scalds may cause only a loss of the surface epithelium of the cornea, which will be reproduced without scar-formation. More commonly much sloughing occurs and the whole cornea may be lost (2661). Corrosives accumulating in the lower part of the conjunctival sac may cause ulceration of both the ocular and palpebral portions of the conjunctiva leading to permanent adhesion of the two surfaces (symblepharon).

2661. An eyeball showing the effects of corrosive fluid. The whole cornea has sloughed leaving a ring of iris exposed. The pupil is occupied by exudate. The globe is flattened, as the result of manipulation during its removal. 8395

The eye was accidentally damaged by corrosive fluid used by the patient in his work.

Complications following Operations on the Eye.

A common complication of the operation of cataract-extraction is the entanglement of the iris or part of the lens capsule in the wound and its subsequent firm adhesion to the cicatrix. The contraction of the adhesions may so draw the lens-capsule and iris forward as to close the filtration angle of the anterior chamber and cause secondary glaucoma (2664). Even if an iridectomy have been done at the time of the extraction, sufficient of the root of the iris may have been left to cause the filtration angle to be closed in this way. A fold of the iris incarcerated in the corneal incision may prevent firm closure of the wound and subsequently the weak part of the scar may bulge, forming a cyst-like swelling (cystoid cicatrix, 2466).

Irido-cyclitis may follow the operation of cataract-extraction; it may be due to direct infection or to irritation of the iris, owing to the latter being entangled in the scar. The irido-cyclitis may lead to detachment of the retina (2668) and shrinkage of the globe; it is also a cause of sympathetic inflammation in the opposite eye.

Suppuration may follow extraction or needling; in the latter case the corneal wound has probably been plugged by a fragment of capsule withdrawn on the needle, thereby allowing infection to spread from the conjunctiva to the interior of the eye.

Hæmorrhage, sometimes extensive, may occur after operations on the globe, either from the iris or the choroid (2663).

2662. A section of an eyeball, upon which an iridectomy had been performed for glaucoma. There is a bulging at the upper corneo-scleral margin into which the stump of the iris protrudes (cystoid cicatrix). The optic disc is deeply cupped. The opacity of the vitreous and the slight detachment of the retina are due to the preparation of the specimen. 7466

There is no history to the specimen.

2663. A section of an eyeball, in which extensive hæmorrhage has taken place immediately after cataract-extraction. The globe is practically filled with blood-clot which protrudes forwards through the corneo-scleral wound. The inner surface of the sclerotic is exposed at the upper part of the globe, where the choroid has been separated from it by the hæmorrhage. 8981

The operation was otherwise uncomplicated.

2664. A section of an eyeball lost from glaucoma following cataract-extraction. In the lower part of the anterior chamber is a blood-clot. The lens is absent, but the capsule is extensively adherent to the upper part of the cornea. The upper part of the iris is wanting; the lower part is thickened and adherent to the remains of the lens-capsule. 7386

After extraction the tension became raised, paracentesis corneæ was twice performed, on the second occasion with loss of vitreous. A partial sclerotomy was subsequently performed, which was followed by hyphæma. Ciliary tenderness and much pain were experienced in the opposite eye.

2665. A section of an eyeball from which the lens has been extracted by operation. The cornea is clouded; the anterior chamber is very deep and contains inflammatory exudation at its lower part. The iris is thickened and adherent to the remains of the lens-capsule. There is inflammatory exudation extending back into the vitreous, especially below.

There is no history to the specimen.

2666. A section of an eyeball affected with glaucoma following cataract-extraction. The lens has been removed with the exception of a small portion remaining below; iridectomy has been performed; the iris is adherent to the remains of the lens. Extending from the wound at the upper corneo-scleral margin through the coloboma of the iris to the back of the ciliary body is a delicate membrane, the remains of the lens-capsule. There is a mass of exudate in the upper part of the ciliary body. The optic nerve is deeply cupped. 7254

There is no history to the specimen.

2667. A section of an eyeball affected with glaucoma and iritis following cataract-extraction. The iris is adherent to the remains of the lens-capsule and also above to the cornea (posterior synechia and anterior synechia). The lens is absent. The retina is completely detached. 7470

The lens was extracted 5 years previously, and this was followed by repeated attacks of inflammation. Two years later the eye was struck with a piece of wood. The tension of the globe was raised.

2668. A section of an eyeball, with detachment of retina and choroid following cataract-extraction. 7473

Some months after cataract-extraction at the age of 68, sight became dim. Opacities could then be seen in the vitreous, and also detachment of the retina.

DISEASES OF THE COATS OF THE EYEBALL.

Corneal Ulcers and their Complications.

Ulcers of the cornea are frequently the result of some form of conjunctivitis, purulent (2670) or phlyctenular (2674); the ulceration, which is a common sequela of the acute specific fevers, is partly the result of the state of general malnutrition. Ulcers of the cornea may also be the result of direct injury or disease of the 5th nerve.

The scar-tissue resulting from the healing of an ulcer usually increases the thickness of the cornea; the scar may be dense (leucoma) or thin (nebula). The perforation of a corneal ulcer may be followed by entanglement (2670) or prolapse (2673) of the iris, or expulsion of the lens (2674) or vitreous. Loss of the vitreous may be followed by shrinking of the eyeball and disorganisation of its inner coats, the sclerotic remaining as a puckered and thickened membrane. After perforation the base of a corneal ulcer may for a varying period be in contact with the anterior capsule of the lens leading to the formation of an anterior polar or pyramidal cataract (2677). Perforation of a corneal ulcer may lead to complete suppuration of the eyeball or a plastic inflammation limited to the ciliary region and resulting in the formation of cyclitic membranes and detachment of the retina (2675); the retina and choroid may also become inflamed and atrophy, and there is frequently disturbance of the hexagonal pigment. In eyes lost from injury or disease, the cornea may become the seat of a transverse film due to the formation of fibrous tissue beneath the epithelium, where it replaces Bowman's membrane. The epithelium is also degenerated and calcareous particles are found in the new fibrous tissue.

2669. A section of an eyeball. The whole cornea is opaque and thinned at a point just below the centre. The lower half of the iris is completely adherent to the cornea and the upper half by its pupillary border. 6465

The thinned part of the cornea indicates the site of a perforation and ulcer which has subsequently healed with entanglement of the iris.

✓ **2670.** A section of an eyeball showing the results of perforation following ulceration of the cornea. The cornea generally is opaque, and at the junction of the upper and middle thirds there is a scar to which the iris is adherent. 8394

The ulceration was secondary to gonorrhœal ophthalmia.

2671. A section of an eyeball destroyed by diphtheritic conjunctivitis. The cornea with the exception of the periphery has completely sloughed, and the gap is filled with a mass of exudate extending backwards into the vitreous cavity. The iris is pushed forwards at the edge of the perforation. The retina is completely detached. 8740

The patient was suffering from severe conjunctivitis which bacteriological examination proved to be diphtheritic.

2672. A section of an eyeball showing the results of perforation caused by a corneal ulcer. There is a scar at the upper part, to which the iris is completely adherent. The iris is free below. There is complete detachment of the retina and the vitreous is occupied by hæmorrhage. 7386

The patient was admitted with purulent ophthalmia stated to have been caught from a new-born child.

✓ **2673.** A section of an eyeball showing perforation of a corneal ulcer. At the lower corneo-scleral margin there is a perforation through which a knuckle of iris protrudes. The anterior chamber is deep and contains fibrinous exudation, which extends around and into the lens and backwards into the vitreous. 7386

2674. A section of an eyeball showing the results of perforating ulcer of the cornea. There is a perforation in the centre of the cornea through which the lens is protruding. 7386

The perforation followed a phlyctenular keratitis.

2675. A section of an eyeball showing the results of sloughing of the cornea. The cornea is mostly destroyed and replaced by scar-tissue, to which the iris is completely adherent. The lens is not recognisable. There is complete detachment of the retina. 7386

The sight was lost, through inflammation, at the age of 6 years. The eye was removed 12 years later.

2676. Half an eyeball disorganised and shrunken as the result of ophthalmia neonatorum. The globe is small; the cornea is opaque and adherent to the iris. The lens is not recognisable; the retina is completely detached. The inner surface of the choroid is rough owing to the presence of grains of calcareous or bony material. 6157

Excision was performed on account of sympathetic irritation of the opposite eye.

2677. Half an eyeball showing the effects of a perforation of the cornea. The cornea is opaque; the iris is thinned and atrophied and adherent to the cornea. At the anterior pole of the lens is a well-defined white opacity. 8980

From a patient who had gonorrhœal conjunctivitis followed by perforation of the cornea. The eye became painful later and was removed.

Staphyloma.

Any abnormal bulging of the eyeball due to preceding inflammation is called a staphyloma, and according to their situation staphylomata are corneal or scleral.

Corneal staphyloma is a common late effect of corneal ulceration; it usually results from the bulging of the scar in the cornea which yields to the intraocular tension (2682). In some cases not only the scar but the whole cornea may be involved in the staphyloma (2678); this is likely to occur when, as the result of the perforation of a corneal ulcer, the entire pupillary margin of the iris becomes adherent to the cornea; the communication between the anterior and posterior chambers is thus closed, and the pressure in the latter rises and presses the iris forwards against the cornea so that the drainage-angle of the anterior chamber becomes occluded (2685). In such cases the increased intraocular tension may cause cupping of the optic disc (2686), and in young subjects the entire globe may become distended (corneal and scleral staphyloma). The corneal staphyloma is lined by the iris which becomes thinned and atrophied (2686). In cases of very extensive corneal perforation the mode of production may be different to that above described. The perforation is at first blocked by the acutely inflamed iris covered with inflammatory exudation (2661). Subsequently a layer of scar-tissue fills the defect in the cornea, and this together with the subjacent portion of the iris becomes bulged forwards, producing a staphyloma.

Scleral staphyloma may be anterior, equatorial, or posterior, or the whole globe may be bulged uniformly. An anterior staphyloma may occur either in that part of the sclera which overlies the ciliary body (ciliary staphyloma, 2687) or in the small area of sclera in front of the root of the iris (intercalary staphyloma, 2688); in both forms the staphyloma is lined by uveal pigment. An anterior staphyloma is usually the result of increased tension arising from primary or secondary glaucoma or of the conditions set up by a perforating corneal ulcer; in the latter case a corneal and scleral staphyloma may coexist. A scleral staphyloma may also result from weakening of the coats of the eyeball by injuries, inflammation or new growths.

Posterior staphyloma usually occurs near the optic disc and is a common result of progressive myopia.

2678. A section of an eyeball affected with staphyloma of the cornea. There is a bulging involving the whole extent of the cornea, which is opaque and much thickened, except at the periphery below where it is thinned. The iris is thinned and spread out over the back of the cornea, to which it is adherent. 7476

The patient suffered from ophthalmia neonatorum. The eye became prominent at 3 months and remained in much the same condition up to the time of removal, at the age of 12 years. The microscope shows that the corneal tissue is largely replaced by fibrous tissue.

✓ **2679.** A section of an eyeball showing staphyloma of the cornea. There is a uniform spherical bulging of the cornea. The iris is adherent to the inner surface of the cornea over its whole extent, but is very thinned and stretched above. 7471

The staphyloma was the result of ophthalmia neonatorum.

2680. A portion of an eyeball affected with staphyloma of the cornea. There is a prominent bulging of the cornea forwards, with adhesion and stretching of the iris over its posterior surface. 6463

✓ **2681.** A section of an eyeball affected with staphyloma of the cornea, the result of ophthalmia neonatorum. The cornea is uniformly bulged and thinned and everywhere lined by iris. There is a broad adhesion of lens capsule to the middle of the inner surface of the cornea, at which spot a perforation had previously occurred. Traces only of the lens and its capsule remain. The optic disc is deeply cupped. 6793

2682. An eyeball in section, showing an irregular staphyloma ot the cornea. The inner surface of the staphyloma is lined by thinned and stretched iris. At one side the cornea is much thinned. The optic disc shows deep cupping. 7458

There is no history to the specimen.

2683. A section of an eyeball showing a staphyloma of the entire cornea. The cornea is much thinned and the iris adherent to its posterior surface. There is cupping of the optic disc. 7464

2684. The anterior half of an eyeball divided through the equator. The whole cornea is bulged and projects prominently forwards near its middle part, where there is a dense opacity (leucoma). 6468

From a patient, aged 4½, who is stated to have had inflammation of the eye two or three years previously.

2685. A section of an eyeball showing a small conical projection at the centre of the cornea. The bulging is lined by iris, which is also in contact with the lower half the cornea: a shallow anterior chamber exists above. Under the microscope the corneal tissue showed a good deal of hæmorrhage into its substance and also hæmorrhage between the iris and cornea; there was much inflammation in the ciliary body. 7386

The patient, aged 60, was struck in the eye by a fragment while breaking stones, 9 weeks previously to excision.

✓ **2686.** A section of an eyeball showing a corneal staphyloma the result of ophthalmia neonatorum. There is a large spherical bulging of the cornea, the inner surface of which is lined by the stretched-out iris; the periphery of the cornea is much thickened and also lined by the iris. The lens is to a large extent absorbed. The optic disc is cupped. 6464

✓ 2687. A section of an eyeball showing a ciliary staphyloma. There is a bulging of the sclera above the cornea, at which spot the sclera is much thinned and allows the uvea to be seen through it. The choroid and retina are thinned and atrophied on the inner surface of the bulging. The lens is opaque and situated in the anterior chamber. There is a calcareous band in the cornea. The optic disc is cupped. 7468

At the age of 10 months the eye was inflamed as the result of small pox. Some years later it was struck with a nail, and was removed on account of pain at the age of thirty-five.

2688. The temporal half of a right eyeball showing an anterior staphyloma (intercalary), the result of an injury. There is a bulging of the upper and anterior part of the sclerotic; the cornea is opaque and, together with the bulged portion of the sclerotic, is lined with thinned and atrophied iris. The lens is almost completely absorbed; the lower part of the capsule is adherent to the posterior surface of the cornea. The retina is detached. 8245

The optic disc was cupped.

2689. Half an eyeball with a staphyloma, removed on account of pain. There is a bulging of the whole cornea; there is a secondary smaller protuberance at its upper part. The iris lines the cornea and the secondary bulging, to both of which it is adherent. 8742

Inflammation of the Iris and Ciliary Body.

In *iritis* the exudation may take place (*a*) from the anterior surface of the iris, accumulating in the anterior chamber, and may be serous, fibrinous (hypopyon, 2691) or hæmorrhagic (hyphæma); (*b*) from the posterior surface causing the iris to become adherent to the lens capsule around the pupillary margin (ring synechia, 2694) or over the whole surface (total posterior synechia); (*c*) into the pupillary area (occlusion of pupil) or into the tissue of the iris itself. As the result of a ring synechia the communication between the anterior and posterior chambers is closed (exclusion of pupil), the pressure in the posterior chamber is increased (secondary glaucoma), and the iris becomes bulged forwards between its peripheral and pupillary attachments (iris bombé, 2694). Recent adhesions between the iris and lens capsule may be broken down by the use of atropin, leaving the posterior of the two pigment layers of the iris attached to the anterior surface of the lens capsule (2691).

Cyclitis is generally associated with iritis but may occur independently. The exudation may reach (*a*) the anterior chamber directly or indirectly through the pupil, (*b*) the posterior chamber, or (*c*) the vitreous. Fibrinous exudation in the anterior chamber is frequently deposited on the back of the cornea in the form of small dots (keratitis punctata); exudation in the posterior chamber may cause total posterior synechia; and in the vitreous appears clinically in the form of floating opacities. A serious result of cyclitis is the organisation of the exudation in the vitreous (cyclitic membrane, 2699): when this change is limited to the anterior part of the vitreous the contraction, by dragging back the ciliary processes and base of the iris, deepens the angle of the anterior chamber but renders the central part of the chamber more shallow by pushing forwards the lens (2693). Such an exudation observed during life has some resemblance to a new growth and is sometimes called a pseudo-glioma (2693). If the vitreous be more extensively invaded by the exudation, the resulting contraction may cause more or less complete detachment of the retina (2692), unless the latter is firmly adherent to the choroid As a later result the process of contraction may lead to complete atrophy of the globe and puckering and thickening of the sclerotic (2698).

Irido-cyclitis frequently follows injuries of the eye, especially when the iris is entangled in the wound, and is the common cause of sympathetic inflammation of the other eye (sympathetic irido-cyclitis). The latter usually appears about six or eight weeks after the original injury, but it has been observed to occur as early as three weeks or as late as forty years.

2690. Half an eyeball affected with irido-cyclitis. The anterior chamber is filled with plastic exudate; there is a similar material in the anterior part of the vitreous. The pupil is circular and free from adhesions. 6468

The patient, aged 57, was suffering from cyclitis with increased tension which was only temporarily relieved by the use of atropine and paracentesis.

2691. Half an eyeball from a case of keratitis with hypopyon and iritis. The lens has been purposely displaced in order to display its anterior surface. The cornea is thinned at its centre. The lower part of the anterior chamber is filled with exudate which is continued upwards to the middle of the cornea as a thin layer. There is disturbance of the iris-pigment at the margin of the pupil; and on the anterior surface of the lens is an almost complete ring of pigment (ring synechia) and within the ring a layer of inflammatory exudate (blocked pupil). There is exudation on the tips of the ciliary processes. 8153

2692. Half an eyeball destroyed from chronic irido-cyclitis. The anterior part of the sclerotic is much thickened and the ciliary body is covered by exudate. The retina is completely detached and appears as a funnel-shaped membrane. The lens is displaced forwards and the iris is in contact with the cornea; stretching behind the lens is a layer of exudate (cyclitic membrane). 8741

The eye was lost as the result of inflammation. Five months after excision the opposite eye became affected with episcleritis which later became complicated with cyclitis and resulted in blindness. No cause of the inflammation could be discovered.

2693. Half an eyeball affected with cyclitis. The retina is detached; the vitreous is filled with a white exudate extending up to the ciliary region and passing behind the lens, which is flattened and pushed forwards so that the pupillary border of the iris nearly touches the cornea whilst the root of the iris is drawn back. 8611

From a child who subsequently died from posterior basic meningitis.

2694. Half an eyeball affected with irido-cyclitis. The anterior chamber is very deep at the centre, where it is occupied by exudate, and obliterated at the periphery. The pupillary margin of the iris is adherent to the lens (ring synechia); the iris is bulged forwards (iris bombé). There is a mass of exudate behind the lens entending into the vitreous. 6470

2695. Half an eyeball disorganised from old irido-cyclitis. The globe is small; the cornea and lens are clear, the latter being pushed forwards so that the anterior chamber is almost obliterated. There is a mass of exudate behind the lens; the retina is completely detached. 8391

The eye was removed *post mortem* from a child who died from simple basic meningitis.

2696. Half an eyeball destroyed by suppuration. The anterior chamber is full of pus; the lens is opaque and there is purulent infiltration of the vitreous. The posterior and external part of the globe is covered with inspissated pus, which extends from Tenon's space into the globe, separating the choroid from the sclerotic. 7472

2697. Half an eyeball destroyed and shrunken as the result of irido-cyclitis. The anterior chamber contains fibrinous exudate, the iris is thickened and adherent to the lens; there is exudate in the pupil and altered blood in the vitreous. All the coats of the eyeball are thickened. 7386

From a patient, aged 55, who had suffered from rheumatic pains; the eye became inflamed and painful 6 months before excision.

2698. Half a shrunken eyeball, disorganised from chronic irido-cyclitis following an attack of measles at the age of 12 months. The cornea is replaced by cicatricial tissue to which the iris is adherent; the lens is not recognisable; the choroid is thinned. The retina is completely detached and shows a small cyst near the posterior end. The sclerotic is thickened. 8028

The eye was removed 11 years after the attack of measles.

2699. Half an eyeball from a patient who had ulceration of the cornea secondary to scarlet fever several years before excision. The cornea is opaque and posteriorly is in contact with the iris; the lens is opaque and calcareous. The retina is not detached, but both it and the choroid are thinned. A delicate membrane behind the lens is attached to the ciliary body at its periphery (cyclitic membrane). 8066

2700. Half an eyeball, shrunken from the effects of irido-cyclitis. The cornea is opaque and the iris is thinned, atrophied and adherent to its posterior surface. The lens is wanting and the posterior capsule is covered with exudation forming a membrane across the front of the cavity of the globe at the level of the ciliary body; stretching from the posterior surface of this membrane is a semilunar fold extending backwards to the optic disc and having a free concave margin and an attached convex one. The retina is not detached. 7461

✓ 2701. Half an eyeball excised from a patient, who had recently suffered from acute rheumatism. The anterior chamber is shallow but contains no exudate; the iris is adherent to the lens. Behind the lens is a mass of fibrous tissue and the ciliary body and anterior part of the choroid are detached from the sclerotic. The retina is completely detached and represented by two rounded prominences, one at the optic disc and the other attached to the fibrous tissue behind the lens. 7253

From a patient, aged 19, who had recently been suffering from acute rheumatism. The eye became inflamed with ciliary tenderness and non-purulent exudation in the anterior chamber.

The contraction of the newly formed tissue in the vitreous has caused the detachment of the retina and the ciliary body and shrinkage of the vitreous.

2702. Half an eyeball the seat of extensive suppuration. The anterior chamber is very shallow; the whole vitreous is occupied by purulent exudation; the choroid is thickened and the retina is detached posteriorly. 6817

DISEASES OF THE CHOROID AND RETINA.

Choroiditis may be suppurative or plastic. Suppurative choroiditis may result from direct infection of the globe by a wound, pyæmia, or extension of inflammation from the meninges. Plastic choroiditis occurs in disseminated patches or discrete spots. In old-standing cases of choroiditis bony deposits may form.

Tuberculous deposits may occur in any part of the uveal tract either in the form of minute grey granulations (2707) or as a large mass simulating a tumour.

Retinitis may occur independently or more frequently in association with inflammation of the choroid (retino-choroiditis). In the latter the two coats become adherent and there is much disturbance of the retinal pigment layer (2705).

Detachment of the Retina from the choroid takes place between the rod and cone layer and the pigment epithelium, the latter remaining adherent to the choroid. The detachment may be partial (2722) or complete; in the latter the retina still remains adherent at the optic disc and the ora serrata (2704). In complete detachment the vitreous cavity becomes obliterated and the subretinal space filled with albuminous fluid; in old-standing detachments the atrophied retina is reduced to a stalk passing from the disc to the back of the lens or to the ora serrata.

Detachment of the retina may be due to direct injury (2637), myopia, new growths (2722), and cyclitis (2692).

Retinal hæmorrhages are common. Extensive hæmorrhage may be associated with glaucoma, in some cases preceding, in others following, the primary disease.

Retinitis proliferans is characterised by a new formation of connective tissue in the vitreous on the surface of the retina; it usually results from a vitreous hæmorrhage (2703).

Tumours of the retina, see Nos. 2733 to 2735.

2703. Half an eyeball from a case of retinitis proliferans. The retina is detached posteriorly, where it is thickened and folded. The vitreous cavity is divided by a funnel-shaped membrane, attached posteriorly to the detached portion of the retina, and anteriorly to the ora serrata. The space between the membrane and the retina is occupied by blood-clot. The angle of the anterior chamber is open, and the sclerotic and choroid are normal. There is a patch of exudation in the lower part of the ciliary body. 8152

From a patient with Bright's disease, who had a vitreous hæmorrhage (Trans. Ophth. Soc. vol. xviii, p. 154).

2704. Half an eyeball disorganised as the result of old irido-cyclitis. The iris and lens are enclosed in a mass of exudate; the retina is completely detached and shows a large cyst. The choroid, especially at its hinder part, shows numerous pale areas, in one of which is some pigment (old choroiditis). 7465

2705. Half an eyeball disorganised by irido-cyclitis. There is a mass of inflammatory exudation behind the upper part of the lens in the ciliary region. The retina is almost completely detached, but remains fixed to the choroid by four pointed processes; the choroid at these spots is pigmented, as the result of past retino-choroiditis. 7386

During life the exudate was very vascular and was thought to be a glioma.

2706. Half an eyeball the seat of old standing disease. The cornea is opaque and the iris is adherent to its posterior surface; the lens is absent. The whole fundus is paler than normal and dotted over with numerous small pigmented areas (retino-choroiditis). The disc is deeply cupped. Behind the ciliary body there is a thin layer of exudate. 7386

The eye was lost from ophthalmia neonatorum and became painful at the age of 33.

2707. The posterior segment of an eyeball everted and the retina removed. The choroid is dotted over with numerous small tubercles of varying size. 6951

2708. Half an eyeball removed on account of pain. The whole eye is enlarged. Over the anterior half of the choroid are numerous pigmented spots; the ciliary processes are atrophied and the base of the iris is adherent to the cornea. The optic disc is deeply cupped. 8978

From a patient who had suffered from interstitial keratitis; later, glaucoma supervened as the result of the adhesion of the base of the iris to the cornea.

GLAUCOMA.

Glaucoma is a condition in which the tension of the eyeball is increased; it is *primary* when no pathological condition is present in the eye to account for the increased tension, and *secondary* when the increased tension is obviously due to some coexistent lesion.

In *primary glaucoma* microscopic examination shows that the drainage-angle of the anterior chamber is blocked, but it is doubtful how far this is the cause or the result of the initial rise in tension. In performing iridectomy for the relief of glaucoma it is necessary that the base of the iris be removed. The increased intra-ocular tension causes atrophy of the iris, ciliary processes and choroid (2712), and bulging of the sclera at its weakest spot, namely, where the optic nerve enters (cupping of the disc, 2709). At a later period the lens becomes opaque. Hæmorrhage may occur into a glaucomatous eye, sometimes after a persistent rise in tension or at an earlier period. Primary glaucoma may be congenital and result from imperfect development of the angle of the anterior chamber; the sclerotic is thin and the whole eyeball becomes enlarged (buphthalmos or ox-eye).

Secondary glaucoma may occur as the result of (1) extensive anterior synechia, following injury or perforating ulcer; (2) ring synechia; (3) cyclitis, if the fluid be abundant and fibrinous; (4) new growths in the retina or choroid; (5) dislocation of the lens into the anterior chamber (2719), or more rarely backwards; (6) cataract-operations and (7) hæmorrhage.

2709. Half an eyeball excised on account of absolute glaucoma. The extreme periphery of the iris is adherent to the corneo-scleral junction. The optic disc is deeply cupped.

✓ **2710.** Half an eyeball excised for glaucoma. The globe is greatly enlarged and the anterior chamber deep, and the base of the iris is extensively adherent to the cornea. The ciliary processes are stretched and atrophied, and the sclerotic is very thin. The optic nerve is deeply cupped; the central vessels can be seen coursing up the sides of the cup and over its edge. The anterior part of the retina is much pigmented at one side. 8393

2711. A section of an eye affected with absolute glaucoma. The periphery of the iris is adherent to the posterior surface of the cornea, obliterating the angle of the anterior chamber. 6472

The detachment of the retina is artificial.

2712. The anterior portion of an eyeball, from which the cornea, sclerotic and iris have been removed to show the atrophied condition of the ciliary body and processes. 7475

From a patient, aged 84. The eye became blind from glaucoma. The optic disc was cupped and there were retinal hæmorrhages.

2713. A normal eye from which the cornea and sclerotic and iris have been removed, to show the natural condition of the ciliary processes. 7463

✓ **2714.** Half an eyeball affected with irido-cyclitis and secondary glaucoma. The anterior chamber is deep and its angle closed by peripheral anterior synechia; the pupillary margin of the iris is adherent to the lens, which is opaque and shrunken. The choroid shows numerous white patches of choroidal atrophy in its anterior half. The optic disc is deeply cupped. 7386

From a patient, aged 34. Inflammation had occurred 8 years previously, and the eye had been blind for the last 2 years with increased tension. The patient had suffered from rheumatism but not rheumatic fever.

/ **2715.** Half an eyeball affected with irido-cyclitis and secondary glaucoma. The anterior chamber is very shallow; the iris is adherent to the lens. Scattered over the whole fundus are small pigmented spots (retino-choroiditis); the optic disc is deeply cupped, and around it is an area of choroidal atrophy. The antero-posterior diameter of the eye is increased. 7386

2716. Half an eyeball affected with irido-cyclitis and secondary glaucoma. The anterior chamber is rather shallow; the pupil is completely occluded by exudate. The lens is absent; in its removal pigment from the lower part of the posterior surface of the iris has become detached. The retina is completely detached and shows a large cyst below. 7386

2717. Half an eyeball removed for pain due to secondary glaucoma. The whole globe is enlarged; the retina is completely detached, and its attachment above to the ora serrata has been ruptured. The lower half of the subretinal space is occupied by blood-clot, which extends to the back of the lens, where the retina is separated from the ora serrata. The lens is flattened as the result of the pressure. The anterior chamber is shallow and its angle closed. 8610

From a child, aged 11, who had always been myopic. The retinal detachment was due to a fall, and later hæmorrhage occurred and set up glaucoma.

2718. Half an eyeball affected with cyclitis and secondary glaucoma. The anterior half of the globe is more prominent than normal. The anterior chamber is filled with blood-clot. There is a layer of exudate extending from the ora serrata over the ciliary processes to the back of the lens. The retina is completely detached and is represented by a thin strand attached to the disc, which is deeply cupped. 7476

2719. Half an eyeball showing a dislocated lens. The anterior two-thirds of the lens project through the pupil and the anterior surface of the lens is in contact with the cornea. A portion of the iris has been removed. There is a fibrous exudate in the anterior part of the vitreous.

TUMOURS OF THE EYEBALL.

Tumours of the eyeball are extra-ocular or intra-ocular.

Extra-ocular tumours. *Dermoid* of the cornea is a congenital tumour and is always situated at the corneo-scleral margin (2720). It has the structure of skin with hair-follicles, sweat-glands and sebaceous glands; the hair may be downy or well marked and may commence to grow at puberty.

Sarcoma and *Carcinoma* both begin at the corneo-scleral margin. The sarcoma has a narrow base and overlaps but does not invade the cornea; the carcinoma has a broad base and invades the cornea (2721).

Intra-ocular tumours include sarcoma of the uveal tract and glioma of the retina.

Sarcoma of the uveal tract is nearly always melanotic. The most frequent seat is the choroid, but it may originate in the iris or ciliary body. Sarcoma of the choroid is either diffuse or circumscribed; the growth causes detachment of the retina, the extent of which may be increased beyond the limits of the tumour by hæmorrhage or exudation (2734); as the result of increasing hæmorrhage and exudation behind the detached retina, secondary glaucoma may be caused (2723). Finally the growth may perforate the globe, usually where the ciliary vessels pass through it, and being no longer confined within the sclerotic, may grow rapidly. Secondary growths may occur in the internal organs, such as the liver.

Glioma of the retina is a disease of infancy, being met with usually before the third year and very rarely after the seventh year. The growth is soft and very quickly degenerates. The growth usually extends backwards and detaches the retina, but in some cases it invades the vitreous and the retina is not detached. In the later stages the tumour, like a sarcoma of the choroid, may cause secondary glaucoma (2735) and eventually perforate the globe, sometimes invading the optic nerve (2733). Secondary deposits may be found in the brain or elsewhere.

Cystic tumours of the iris may result from implantation of corneal epithelium by a penetrating wound, or may be derived from the epithelium on the front of the iris or from separation of the two layers of pigment-cells on the back of the iris.

2720. A dermoid tumour removed from the cornea. The growth is flattened, about the size of a pea; it consists of a piece of skin from which several long hairs project. 8608

2721. An eyeball, together with part of the lower lid and the ocular conjunctiva. Occupying the lower part of the ocular conjunctiva and the adjacent part of the lower lid is a slightly elevated flattened growth, which at its upper part somewhat overhangs the corneo-scleral junction. The growth measures about 1 cm. transversely, and is ulcerated in its central part. 8609

Microscopic Structure.—The growth is a squamous-cell carcinoma.

✓ **2722.** Half an eyeball removed for new growth. There is a flattened pigmented growth growing from the posterior part of the choroid and extending up to the entrance of the optic nerve. There is a detachment of the retina corresponding to the growth. 7386

Microscopic Structure.—The tumour is a melanotic sarcoma consisting of round and spindle cells.

From a patient, aged 45; the sight became misty one month before excision. The eye had been damaged by two blows, one 12 years, the other 8 months, before excision.

✓ **2723.** Half an eyeball containing a melanotic sarcoma. There is a large growth extending from the back of the eye forwards to the ora serrata. The retina is completely detached; the lens and iris are pushed forwards, closing the angle of the anterior chamber. 8979

From a patient, aged 55. Sight was lost suddenly two years previously to excision, and the eye became painful 14 days before excision, at which time it showed all the signs of glaucoma and was quite blind. The other eye was normal. The patient was well 2 years and 7 months afterwards.

2724. Half an eyeball the seat of a new growth. There is a melanotic sarcoma springing from the lower half of the choroid and occupying about half the cavity of the globe. The retina is completely detached, and the iris in apposition with the cornea. 6385

2725. Half an eyeball the seat of a melanotic sarcoma which has grown from the choroid and occupies rather more than half the cavity of the globe. The retina is completely detached and is surrounded by growth. The lens and iris are pushed forward against the cornea. 6169

2726. Half an eyeball the seat of a melanotic sarcoma, growing from the choroid. The tumour consists of a circular flattened portion springing from the posterior part of the choroid, and projecting from the centre of this is a rounded mass. A small portion of the growth has perforated the sclerotic close to the optic nerve. The retina is completely detached; there is blood in the anterior chamber, which is very shallow. There is a hæmorrhage in the optic nerve at the level of the lamina cribrosa. A portion of the iris has been removed by iridectomy. 6468

The patient had all the symptoms of acute glaucoma, for which iridectomy was performed. The wound healed rapidly and the symptoms were relieved. In about 6 weeks time symptoms returned and the eye was excised.

2727. Half an eyeball the seat of a melanotic sarcoma. There is a rounded tumour springing from the posterior part of the choroid and extending to the back of the lens. The retina is detached. The anterior chamber is occupied by a structureless material, probably exudate. The eye is flattened from before back. 6468

From a patient, aged 45, who was totally blind and suffered acute pain in the eye.

2728. An eyeball containing a growth. There is a spongy pigmented growth within the globe, which has extended through the globe in the neighbourhood of the optic nerve. The extra-ocular portion of the growth is much firmer and less pigmented. 3639

From a patient, aged 24; the disease was of 3½ years duration, and projection of the globe occurred after 2 years. The disease recurred in the orbit several months after excision.

2729. An eyeball affected with melanotic sarcoma. The optic nerve is apparently unaffected; the shrunken globe is seen in section and is filled with melanotic growth. The sclerotic is thickened and wrinkled. There is a spongy mass of growth outside it.

2730. The eyelids, optic nerve, and a mass of pigmented growth removed from the orbit. 3649

Microscopic Structure.—The growth is a melanotic sarcoma.

The eyeball had been excised on account of a tumour about the size of a hazel nut attached to its outer part. The tumour recurred and was removed by Liston.

2731. A melanotic tumour removed *post mortem* from the orbit. It is rounded in shape and enclosed in a delicate capsule, to which at one part a piece of skin is attached. The tumour itself is spongy. 3645

The eye was removed on account of violent inflammation; 6 years later the tumour appeared just within the lower lid. Secondary deposits occurred in the viscera, abdominal walls and spinal cord.

✓ 2732. Half an eyeball excised for sarcoma. Springing from the choroid around the optic nerve is a flattened slightly pigmented growth, from the middle of which a globular, exceedingly vascular mass, projects forwards. The retina is detached. The subretinal space was occupied by coagulated fluid, the removal of which has brought away portions of choroid, leaving the sclerotic exposed. 7525

The patient had been blind for 3 years; the eye then became suddenly painful and glaucomatous.

2733. Half an eyeball the seat of a glioma of the retina. The retina is detached, and the growth appears both in the subretinal space and anteriorly in the vitreous cavity. 7386

Microscopic Structure.—The growth consists of small round cells and is very vascular. The optic nerve was also infiltrated with growth. The retina showed numerous small nodules of glioma in addition to the main mass.

From a patient, aged 4 years; the eye had been noticed to give a bright reflex 4 months before excision.

✓ 2734. Half an eyeball with a glioma. There is a small mass of glioma springing from the neighbourhood of the optic nerve. The retina is completely detached, the lens is wanting. The anterior chamber is normal. 8612

From a child, aged 2; the eye was removed in July, recurrence in the orbit took place in the following November; the orbit was then completely emptied, but the child died with cerebral symptoms the following March.

✓ 2735. Half an eyeball containing a glioma. The anterior chamber is obliterated and the lens pushed forward. The cavity of the globe is almost completely filled by growth. The retina is detached and can be recognised anteriorly, but elsewhere is obscured by the growth. The anterior and lower part of the choroid is detached from the sclerotic.

PERSISTENT HYALOID ARTERY.

2736. Half an eyeball removed on account of injury. Projecting from the optic disc and projecting forward into the vitreous is a small thread-like structure about 3 mm. long. About 2 mm. from the optic disc is a small inflammatory patch. 7477

The patient was wounded with a piece of steel which was removed by the magnet a month after the injury. The opposite eye subsequently became irritable.

INJURIES AND DISEASES OF THE ORBIT.

WOUNDS OF THE ORBIT.

Amongst the most serious injuries of the orbit are penetrating wounds. The external evidence of the injury may be slight, as the penetration may occur between the globe and the upper lid. Such a wound may involve the roof of the orbit and be followed by intracranial suppuration; it may divide the optic nerve and may be followed by orbital cellulitis, especially if a foreign body is retained.

2737. A fragment of wood, measuring about 2·5 cm. in length, removed from the orbit.

FRACTURE OF THE ORBIT.

The bony wall of the orbit, especially the roof, may be involved by fractures extending into it from the adjacent part of the base of the skull. As the result of such a fracture blood may be effused into the orbit, sometimes in amount sufficient to cause proptosis; occasionally the optic nerve is injured.

TUMOURS OF THE ORBIT.

Among the *Cystic tumours* met with in the orbit are included dermoids, cephaloceles, and hydatids. The most important solid tumours are nævus, osteoma, and sarcoma.

Osteoma of the orbit is usually of the ivory variety; it may originate in the bony wall of the orbit or grow into the cavity from the frontal sinus.

Sarcoma of the orbit usually runs a very malignant course and soon invades the surrounding parts (690). The tissues of the orbit may be invaded by a sarcoma of the eyeball and the cavity is not uncommonly involved by the direct extension of a sarcomatous tumour originating in the surrounding parts (709, 710, 727). The orbit is rarely the seat of a secondary deposit of sarcoma (738).

Tumours of the lachrymal gland are most commonly endotheliomata and closely resemble the tumours met with in connection with the salivary glands.

Intraorbital Aneurism. This name is applied to a condition in which the prominent symptom is pulsating exophthalmos. The pathology of this affection is inconstant, but the most common cause is an arterio-venous communication involving the internal carotid artery and the cavernous sinus.

2738. Half an eyeball, together with half a solid tumour of the orbit, which is loosely connected with it. The tumour is encapsuled and measures 2·5 cm. by 2 cm.

Microscopic Structure.—The tumour is a round-cell sarcoma.

2739. Fragments of a myeloid sarcoma of the orbit. The surface of the section has a somewhat marble-like appearance, the darker areas having in the recent state a reddish brown colour. 9928

Microscopic Structure.—The tumour is a typical giant-cell sarcoma. It is highly cellular and contains a very large number of giant-cells, having their nuclei massed in the centre of the cells. The growth is pervaded with hæmorrhage.

From a woman, aged 54, who was admitted into U. C. H. under the care of Mr. Percy Flemming in 1904. She complained of swelling and drooping of the left upper cyelid of three months duration. A swelling could be felt below the outer two-thirds of the left upper orbital margin, displacing the eyeball slightly downwards, forwards and inwards; the swelling, except at one spot, felt solid. The tumour was removed through an incision along the margin of the orbit; it appeared to invade the roof of the orbit, which was scraped. (Trans. Ophth. Soc. 1905, vol. xxv, p. 242.) A recurrent growth was removed 5 months later. There was no apparent recurrence 3 months after the second operation.

2740. A tumour removed by operation from the orbit. It is lobulated and about 2·5 cm. in its greatest diameter. 9174

Microscopic Structure.—"The tumour is a sarcoma. In many parts the cellular elements are arranged in a very definite manner around a thick-walled blood-vessel. Some of the cells are large and rounded and present an indistinct alveolar arrangement."

From a girl, aged 5, who was admitted into U. C. H. under the care of Mr. Godlee, Jan. 14, 1903. A month before admission the child was noticed to have "a cold in the left eye." On admission the left eyeball was displaced forwards, downwards, and outwards; in the upper and inner quadrant of the orbit the firm slightly lobulated solid swelling could be felt between the eyeball and the wall of the orbit; there was optic neuritis on the left side. An incision was made along the upper margin of the orbit and the tumour readily enucleated; it extended backwards and also outwards to the position of the lachrymal gland. In Jan. 1904 a tumour could be felt between the eyeball and the outer orbital margin; on removal it was found to be more adherent to the surrounding structures than the primary tumour but like it, consisted partly of a firm white substance and partly of a soft bluish-red gelatinous substance. In July 1904, a recurrent growth could be felt at the upper and inner part of the orbit; the whole of the orbital contents were removed. Further operations for recurrences in the orbit were performed in Oct. and Nov. 1904; on the latter occasion the recurrence was extensive and involved the bony walls of the orbit. In Jan. 1905 there was further extensive recurrence and the child complained of headache. Death occurred a few months later, evidently from intracranial extension of the disease.

INDEX TO PART III.

Abscess, cerebellar, 2628-2630.
„ cerebral, 2632, 2634, 2635.
„ epididymis, 2121, 2122, 2132, 2173.
„ mammary, 2217, 2218, 2221.
„ perineal, 1952, 2072, 2079-2081.
„ perirenal, 1915.
„ prostatic, 2081, 2082, 2085, 2175, 2194.
„ tibia, 2439.
„ urethra, 2079-2084, 2175, 2183, 2184.
„ vas deferens, 2117, 2132.
Actinomycosis of breast, 2221.
Adrenal tumour of kidney, 1923, 1924.
Amniotic bands, constrictions by, 2570.
Amputation-stumps, 2470-2486.
„ bulbous nerves, 2481.
„ conical, 2482-2486.
Angioma of skin, arterial, 2396.
„ „ capillary, 2391, 2392.
„ „ cavernous, 2393-2395.
„ „ lymphatic, 2398-2401.
Ankylosis of ankle-joint, 2593.
„ elbow, 2562.
„ wrist, 2562.
Antrum, mastoid, suppuration in, 2623-2627, 2631, 2633.
„ maxillary, polypus of, 2620.
Anus, imperforate, 2534-2547.
Atheromatous cyst, 2450-2458.
Auditory meatus, exostosis, 2622.

Bladder, calculi. *See* Calculi, vesical.
„ carcinoma, 1981-1985.
„ cystitis, acute, 1954, 1956-1959.
„ „ chronic, 1874, 1945, 1955, 1960, 1961, 1962, 1964, 1982, 1984, 1992, 1993, 2057, 2059, 2072, 2076, 2082, 2084, 2087, 2178, 2185, 2195, 2196.
„ „ membranous, 1960, 1962.
„ „ suppurative, 1954.
„ dilatation, 1948, 1951, 1953, 1956, 1961, 1969, 1989, 2076, 2082, 2083, 2177-2180, 2182, 2194.
„ extroversion, 2546, 2547, 2549-2552.
„ fasciculated, 1945, 1946, 1948, 1949, 1954, 1961, 1966, 1967, 1988, 1991, 2054, 2082, 2086, 2184, 2189, 2191.
„ foreign bodies, 1933-1944.
„ hypertrophy, 1945, 1946, 1947, 1949, 1950, 1954, 1960, 1964-1968, 1981, 1983, 1984, 1987-1991, 1993, 1995, 1996, 2059, 2072, 2073, 2076, 2078-2084, 2086, 2087, 2178, 2181-2183, 2189, 2194-2196.

Bladder, lithotomy, 1993, 1994, 2052-2054.
,, lithotrity, 1955, 2057, 2059, 2060.
,, membranous casts, 1957-1959.
,, myxoma, 1980.
,, papilloma, 1922, 1964-1979.
,, perforation, 1982.
,, puncture, rectal, 2078.
,, ,, suprapubic, 1964.
,, rupture, 1929-1932.
,, sacculi, 1949-1955, 1962, 1969, 1989, 1990, 1991, 2054, 2077, 2086, 2189.
,, ,, inflamed, 1954, 1962, 1991, 2086.
,, ,, with calculus, 1953, 1955, 1992, 2185, 2191
,, sarcoma, 1986.
,, suprapubic cystotomy, 1986.
,, tubercle, 1963, 2193.
,, ulceration, 1915, 1949, 1956, 1963, 1988-1991, 2059, 2079, 2194.
Bones, abscess, 2439.
,, absence of, 2561-2564, 2566-2568, 2578.
Brain, abscess. *See* Abscess.
Branchial cyst, 2500, 2501.
,, fistula, 2502.
Breast, actinomycosis, 2221.
,, adenoma, 2244.
,, chronic abscess, 2217, 2218, 2221.
,, ,, interstitial mastitis, 2214-2216, 2229, 2230.
,, cysts, 2222-2243.
,, ,, in chronic mastitis, 2214, 2229, 2230, 2259.
,, ,, multiple, 2225-2233.
,, ,, single, 2222-2224.
,, ,, with carcinoma, 2311, 2312, 2316, 2317.
,, ,, with intracystic growths, 2234-2243.
,, cystic adenoma, 2261-2267.
,, fibro-adenoma, 2245-2260, 2309, 2310.
,, ,, multiple, 2256, 2260, 2310.
,, gumma, 2220.
,, sarcoma, 2268-2277.
,, tubercle, 2218, 2219.
,, carcinoma, 2279-2324.
,, ,, atrophic, 2281, 2283, 2284, 2288, 2290.
,, ,, colloid, 2301-2308.
,, ,, columnar cell, 2315-2317.
,, ,, with cyst, 2311, 2312, 2316, 2317.
,, ,, with duct-papilloma, 2311.
,, ,, with fibro-adenoma, 2309, 2310.
,, ,, invading pectoralis, 2293.
,, ,, in male, 2321-2324.
,, ,, with Paget's disease, 2313, 2314.
,, ,, spheroidal-cell, 2279-2314, 2321, 2324.
,, ,, ulcerated, 2278, 2288, 2289, 2291, 2292, 2300, 2308, 2316, 2323.
Bulbous nerves, 2481.

CALCULUS, nasal, 2607, 2608.
,, prostatic, 2188-2192.
,, renal. *See* Kidney.
,, ureteral, 1897-1899, 1908, 1911-1913, 1995.
,, urethral, 1941, 2066-2074.
,, vesical, 1987-2063.
,, ,, articulated, 1994, 1995?, 2006.
,, ,, bladders containing, 1953, 1955, 1985, 1987-1996, 2057, 2185, 2196.
,, ,, carbonate of calcium, 2044.
,, ,, cystin, 2040-2043.
,, ,, encysted, 1953, 1992, 2185, 2191.
,, ,, facetted, 2005, 2022.
,, ,, foreign body as nucleus, 1937-1944, 2011.

Calculus, vesical, fusible, 2036, 2037.
,, ,, hour-glass, 1993, 1996, 2004.
,, ,, lithotrity, 1937, 1955, 2056–2063.
,, ,, large, 1995, 2001, 2002, 2004, 2006, 2007, 2020, 2031, 2034.
,, ,, miliary, 1997.
,, ,, mixed, 1985, 1987, 1989, 1994, 1995, 2005, 2008, 2009, 2012, 2013, 2014, 2015, 2045–2051, 2060.
,, ,, multiple nucleus, 2010.
,, ,, oxalate of calcium, 2016, 2027–2031.
,, ,, passed per urethram, 1998–2000, 2192.
,, ,, phosphatic, 2001, 2011, 2016, 2032–2039, 2061.
,, ,, ,, ammonio-magnesic, 2034, 2035.
,, ,, ,, calcic, 2032, 2033.
,, ,, ,, mixed, 2036–2039.
,, ,, radiogram of, 2016.
,, ,, spontaneous fracture, 2013, 2014, 2015.
,, ,, urate of ammonium, 2023–2025.
,, ,, uric acid, 1997–2000, 2003, 2007, 2010, 2016–2022, 2058, 2062, 2196.
,, ,, with carcinoma, 1985.
,, ,, xanthine, 2026.
Carcinoma of bladder, 1981–1985.
,, breast. *See* Breast.
,, conjunctiva, 2721.
,, kidney, 1921, 1922.
,, penis, 2209–2213.
,, prostate, 2195–2199.
,, rectum, 2197.
,, scrotum, 2169–2172.
,, skin, 2169–2172, 2209–2213.
,, ,, rodent, 2446–2449.
,, ,, squamous, 2435–2445.
,, testicle, 2155–2159.
,, vesicula seminalis, 2195.
Carpal bones, absence of, 2563.
,, ,, ankylosis, 2562.
Cataract-extraction, complications after, 2662–2668.
Cephalocele, 2494–2498.
Cerebellar abscess, 2628–2630.
Cerebral abscess, 2632, 2634, 2635.
Cervical rib, 2508.
Choroid, atrophy, 2714, 2715.
,, detachment, 2643, 2648, 2653, 2657, 2663, 2668, 2701, 2735.
,, inflammation, 2704–2708, 2715.
,, ossification, 2655, 2656, 2658, 2676.
,, tubercle, 2707.
Cleft-palate, 2487–2493.
Club-foot, acquired, 2591–2597.
,, congenital, 2571–2577.
Colotomy, inguinal, 2539, 2540.
,, lumbar, 2545.
Conjunctiva, hæmorrhage into, 2636.
,, carcinoma, 2721.
Corn, 2403, 2582.
Cornea, burns, 2661.
,, cystoid cicatrix, 2662.
,, leucoma, 2684, 2687.
,, staphyloma. *See* Staphyloma.
,, ulcer, 2669–2677.
,, ,, with anterior synechia, 2669, 2670, 2672, 2673, 2675–2677.
,, ,, ,, detachment of retina, 2671, 2672, 2675, 2676.
,, ,, ,, intraocular hæmorrhage, 2672.
,, ,, ,, perforation, 2669–2677.
,, ,, ,, prolapse of lens, 2674.
,, wounds, 2639, 2640, 2642–2651, 2659.
Cyclitis, 2693. *See also* Irido-cyclitis.

Cyst of breast, 2222–2243. *See also* Breast.
,, dermoid, of hand, 2326.
,, ,, neck, 2500, 2501, 2503–2505.
,, ,, scalp, 2499.
,, ,, scrotum, 2168.
,, ,, trunk, 2528.
,, nasal fossa, 2616 B.
,, prostatic, 2200.
,, sebaceous, 2450–2458.
Cystitis, acute, 1954, 1956–1959.
,, chronic, 1874, 1945, 1955, 1960–1962, 1964, 1982, 1984, 1992, 1993, 2057, 2059, 2072, 2076, 2082, 2084, 2087, 2178, 2185, 2195, 2196.
,, following parturition, 1958, 1959.
,, ,, spinal injury, 1956.
,, membranous, 1960, 1962.
,, suppurative, 1954.
,, with membranous casts, 1957–1959.
Cysto-adenoma of breast, 2261–2267.
,, testis. *See* Testicle, mixed tumours.
Cysto-sarcoma of testis. *See* Testicle, mixed tumours.
Cystotomy, suprapubic, 1986.

Dermoid of eye, 2720.
,, hand, 2326.
,, neck, 2500, 2501, 2503–2505.
,, scalp, 2499.
,, scrotum, 2168.
,, trunk, 2528.
Dislocation of hip-joint, congenital, 2566.
,, lens, 2719.

Ear, middle, suppuration of. *See* Otitis media.
Elbow-joint, ankylosis, 2562.
Encephalocele, 2496, 2497.
Epididymis, abscess of, 2121, 2122, 2132, 2173.
,, gumma of, 2142.
,, hydrocele of, 2100–2103.
,, tubercle, 2117–2129, 2131, 2132, 2173
Epispadias, 2549–2552.
Exostosis of auditory meatus, 2622.
Extra-uterine gestation, 1944.
Extravasation of urine, 2072, 2084, 2086, 2087.
Extroversion of bladder, 2546, 2547, 2549–2552.
Eye, burns, 2661.
,, contusions, 2637, 2638.
,, corneal ulceration, 2669–2677.
,, foreign bodies, 2659, 2660.
,, glaucoma, primary, 2662, 2709–2712.
,, ,, secondary, 2664, 2666, 2667, 2708, 2714–2719.
,, inflammation. *See* Cornea, Retina, Choroid, Irido-cyclitis, Cyclitis.
,, operations, complications after, 2662–2668.
,, staphyloma. *See* Staphyloma.
,, tubercle, 2707.
,, tumours, 2720–2735.
,, wounds, 2639–2660.

Femur, absence of, 2568.
,, malformation of, 2568.
Fibroma of naso-pharynx, 2617.
,, penis, 2204, 2205.
,, skin, 2364–2380.
Fibula, absence of, 2566.

Fingers, absence of, 2563–2565.
„ fusion of, 2560.
„ imperfect development, 2561, 2562.
„ supernumerary, 2558, 2559.
Fistula, branchial, 2502.
„ recto-urethral, 2072.
„ renal, 1903, 1909.
„ urinary, 1993, 2072, 2082–2084.
Flat-foot, 2600.
Foot, deformities, acquired, 2592–2602. *See also* Leprosy, anæsthetic.
„ „ congenital, 2569–2582.
Fracture of tibia, 2595.
Frontal sinus, suppuration, 2621.

GANGRENE from arterial disease, 2463–2465, 2469.
„ from bandaging, 2462.
„ from embolism, 2466, 2468.
„ hospital, 2333, 2334.
„ inflammatory, 2336.
„ of lower limb, 2333, 2334, 2463–2467, 2469.
„ of nose, 2603.
„ of upper limb, 2336, 2462, 2468.
Genu recurvatum, 2563, 2569.
„ valgum, 2589, 2590.
Glaucoma, 2662, 2709–2712.
„ secondary, 2664, 2666, 2667, 2708, 2714–2719.
Glioma of retina, 2733–2735.
Gonorrhœal warts, 2404–2406.
Gumma of breast, 2220.
„ epididymis, 2142.
„ testicle, 2133–2142.

HÆMATOCELE, 2110–2114.
„ suppurating, 2112.
Hallux valgus, 2594, 2601, 2602.
Hammer-toe, 2403, 2581, 2582.
Hare-lip, 2487.
Hernia into processus vaginalis, 2557 A.
„ testis, 2128–2130.
„ with hydrocele, 2097–2099, 2107.
„ with undescended testis, 2557 A.
Hip-joint, congenital dislocation, 2566.
Horn, cutaneous, 2409, 2410, 2458.
Hyaloid artery, persistent, 2736.
Hydrocele of epididymis, 2100–2103.
„ hæmorrhage into, 2097, 2099. *See also* Hæmatocele.
„ infantile, 2098.
„ multilocular, 2103.
„ of spermatic cord, 2104–2109.
„ vaginal, 2090–2097, 2099, 2109.
„ „ secondary, 2124, 2126, 2133, 2134, 2137, 2140, 2144–2146, 2163.
„ with hernia, 2097–2099, 2107.
Hydronephrosis, 1928. *See also* Kidney, dilated.
„ congenital, 2523.
„ calculous, 1911, 1914.
„ hæmorrhage into, 1914.
Hypertrophy of bladder, 1945–1947, 1949, 1950, 1954, 1964–1968, 1981, 1983, 1984, 1987–1991, 1993, 1995, 1996, 2059, 2072, 2073, 2076, 2078–2084, 2086, 2087, 2178, 2181–2183, 2189, 2194–2196.
„ kidney, 1913.
„ prepuce, 2203.
„ prostate. *See* Prostate, Chronic enlargement.
„ skin of nose, 2604–2606.
„ skin of penis, 2203.

Hypopyon, 2639, 2641, 2690, 2691, 2694, 2697.
Hypospadias, 2548.

Irido-cyclitis, 2690–2692, 2694–2700, 2702, 2704, 2705, 2714–2717.
Iris bombé, 2694.
Iritis. *See* Irido-cyclitis.

Keloid, 2370–2374.
Kidney, adrenal growth, 1923, 1924.
„ calculi, 1878–1914.
„ „ changes due to, 1885–1899, 1903–1914.
„ „ mixed, 1879, 1900, 1901, 1902, 1910.
„ „ nephrectomy, 1903, 1905–1908.
„ „ oxalate of calcium, 1878, 1880, 1884 A, 1890.
„ „ removed by operation, 1883, 1884, 1884 A, 1900–1902.
„ „ uric acid, 1881, 1882, 1887, 1889, 1891, 1903, 1905, 1907, 1995.
„ „ with carcinoma, 1878.
„ „ with papilloma, 1888.
„ carcinoma, 1921, 1922.
„ dilated, 1872, 1874–1877, 1886–1891, 1895–1897, 1903, 1905, 1906, 1913, 1922, 1965, 1967, 1968, 1980, 2199, 2544, 2553. *See also* Hydronephrosis, Pyonephrosis.
„ fistula, 1903, 1909.
„ horse-shoe, 2523.
„ hydronephrosis, 1911, 1914, 1928.
„ „ congenital, 2523.
„ hypertrophy, 1913.
„ inflammation, 1872–1876.
„ papilloma, 1888, 1914.
„ rupture, 1871.
„ sarcoma, 1918–1920, 1926.
„ shrunken, 1893, 1904, 1912, 1968.
„ tubercle, 1914 A–1917.
„ tumours of doubtful nature, 1925, 1927.
Knee, contracted, 2591.
„ over-extension, 2563, 2569.

Lachrymal gland, tumours, 2740.
Lateral curvature of spine, 2583–2587.
Lens, dislocation, 2719.
„ prolapse, 2674.
„ wound, 2644, 2649.
Leprosy, anæsthetic, 2343–2357.
„ nodular, 2339–2342.
Limb-deformities, acquired, 2589–2602. *See also* Leprosy, anæsthetic.
„ congenital, 2558–2582.
Lipoma of spermatic cord, 2166, 2167.
„ subcutaneous, 2381–2388.
„ „ suppurating, 2386.
Lithotomy, 1993, 1994, 2052–2054.
Lithotrity, 1937, 1955, 2055–2063.
Lung, syphilis, 2144.
Lupus verrucosus, 2337.
Lymphatic nævus, 2398–2401.

Madura foot, 2358–2363.
Mastitis, chronic, 2214–2216, 2229, 2230, 2259.
Mastoid Antrum. *See* Antrum.
Meningocele, cranial, 2494, 2498.
„ spinal, 2520.
Meningo-encephalocele, 2495.
Meningo-myelocele, 2510–2519.
Middle ear, suppuration. *See* Otitis media.

Mole, pigmented, 2407.
Mucous polypus of antrum, 2620.
" " nose, 2610-2616.
Muscles, abnormalities, 2562.
Myxoma of bladder, 1980.
" subcutaneous, 2389.

NÆVO-LIPOMA, 2397.
Nævus, arterial, 2396.
" capillary, 2391, 2392.
" cavernous, 2393-2395.
" lymphatic, 2398-2401.
Nail, overgrowth, 2460, 2461.
Nasal fossæ. *See* Nose.
Naso-pharynx, fibroma, 2617.
" sarcoma, 2618, 2619.
Neck, branchial fistula, 2502.
" congenital cysts of, 2500-2505.
" teratoma, 2506, 2507.
Necrosis of hip-bone, 2065.
" skull, 2621.
Nephrectomy, 1903, 1905-1909, 1916, 1918-1921, 1923-1927.
Nephritis, suppurative, 1872-1876.
Nephrotomy, 1904, 1913, 1916, 1922.
Nerves, bulbous, 2481.
Nose, cyst, 2616 B.
" foreign bodies, 2607, 2608.
" gangrene, 2603.
" hypertrophic rhinitis, 2609.
" hypertrophy of skin of, 2604-2606.
" mucous polypi, 2610-2616.
" tubercle, 2616 A.

ORBIT, foreign bodies, 2737.
" tumours, 2738-2740.
Orchitis, acute, 2115, 2116.
Otitis media, 2623-2627, 2631, 2633.
" " cerebellar abscess, 2628-2630.
" " cerebral abscess, 2632, 2634, 2635.
" " phlebitis of lateral sinus, 2633.

PAGET'S disease of the nipple, 2313, 2314.
Palate, cleft, 2487-2493.
Papilloma of bladder, 1922, 1964-1979, 2085.
" kidney, 1888, 1914.
" penis, 2206-2208.
" skin, 2402-2410.
" ureter, 1922.
" vulva, 2404-2406.
Patella, absence of, 2568.
Penis, carcinoma, 2209-2213.
" epispadias, 2549-2552.
" fibroma, 2204, 2205.
" hypertrophy of skin of, 2203.
" hypospadias, 2548.
" papilloma, 2206-2208.
" phimosis, 2201, 2202.
" sloughing of skin of, 2086.
Perineal abscess, 1952, 2072, 2079-2082.
Perirenal abscess, 1915.
Pes cavus, 2598, 2599.

Phalanges, absence of, 2561–2565, 2578.
Phlebitis of lateral sinus, 2633.
„ spermatic veins, 2116.
Phimosis, 2201, 2202.
Prepuce, adherent, 2202.
„ hypertrophy, 2203.
„ long, 2206.
„ œdema, 2212.
„ papilloma, 2206, 2208.
„ perforation, 2211.
„ phimosis, 2201, 2202.
Prostate, abscess, 2081, 2082, 2085, 2175, 2194.
„ calculi, 2188–2192.
„ carcinoma, 2195–2199.
„ chronic enlargement, 1898, 1948, 1949, 1954, 1955, 1961, 1989, 1990, 2057, 2059, 2176–2187, 2200.
„ cysts, 2200.
„ excision, 2186–2187.
„ tubercle, 1915, 1963, 2132, 2173, 2193, 2194.
Prostatectomy, 2186–2187.
Pyelo-nephritis, 1872, 1874–1876, 1895, 1905, 1915.
Pyonephrosis, 1897, 1904, 1906–1908, 1910, 1916, 1963.

Radius, absence of, 2563, 2564.
„ imperfect development, 2563.
Rectum, carcinoma, 2197.
„ imperforate, 2534–2539.
„ „ opening into bladder, 2540.
„ „ „ „ urethra, 2541, 2542.
„ „ „ „ vagina, 2543, 2544.
„ „ „ on abdominal wall, 2546, 2547.
„ stricture, 2072.
„ ulceration, 2194.
Renal fistula, 1903, 1909.
Retained testicle, 2539, 2554–2557 a.
„ „ carcinoma of, 2159.
„ „ sarcoma of, 2154.
„ „ with hernia, 2557 a.
Retina, cyst of, 2638, 2698, 2704, 2716.
„ detachment of, 2637, 2638, 2640, 2643, 2647–2653, 2655, 2656, 2667, 2668, 2671, 2672, 2675, 2676, 2688, 2692, 2695, 2698, 2701–2705, 2716–2718, 2722–2727, 2733–2735.
„ glioma, 2733–2735.
Retinitis, 2703, 2705, 2706, 2715.
Rhinitis, hypertrophic, 2609.
Rhinolith, 2607, 2608.
Rib, cervical, 2508.
Rodent carcinoma, 2446–2449.

Sacculi of bladder, 1949–1955, 1962, 1969, 1989, 1990, 1991, 2054, 2077, 2086, 2189.
„ „ with calculi, 1953, 1955, 1992, 2185, 2191.
„ „ inflamed, 1954, 1962, 1991, 2086.
Sacro-coccygeal tumour, 2529–2533.
Sarcoma of bladder, 1986.
„ breast, 2268–2277.
„ deep fasciæ, 2433, 2434.
„ eye, melanotic, 2722–2732.
„ kidney, 1918–1920, 1926.
„ naso-pharynx, 2618, 2619.
„ skin, alveolar, 2421–2426.
„ „ melanotic, 2427–2432.
„ „ round-cell, 2417–2420.
„ „ spindle-cell, 2411–2416.

Sarcoma of spermatic cord, 2147, 2149, 2151.
" testicle, 2145–2154.
" " fungating, 2157.
" " undescended, 2154.
" " with hydrocele, 2145, 2146.
Scalp, dermoid cyst of, 2499.
Scoliosis, 2583–2587.
Scrotum, blood-cyst, 2114,
" carcinoma, 2169–2172.
" dermoid, 2168.
Sebaceous cyst, 2450–2458.
Sinus, frontal, suppuration of, 2621
" lateral, phlebitis of, 2633.
" maxillary, polypus of, 2620.
Skin, carcinoma, 2169–2172, 2209–2213.
" " rodent, 2446–2449.
" " squamous, 2435–2445.
" chronic ulcer, 2331.
" corn, 2582.
" dermoid. *See* Dermoid.
" fibroma, hard, 2364–2369.
" " multiple, 2378–2380.
" " soft, 2375–2377.
" foreign bodies, 2325, 2327–2329.
" gangrene. *See* Gangrene.
" horn, 2409, 2410, 2458.
" hypertrophy, 2203.
" " of sweat-glands, 2459.
" keloid, 2370–2374.
" leprosy, 2339–2342.
" nævus, arterial, 2396.
" " capillary, 2391, 2392.
" " cavernous, 2393–2395.
" nævo-lipoma, 2397.
" neuropathic ulceration, 2335.
" papilloma, 2402–2410.
" phagedænic ulcer, 2332.
" pigmented hairy mole, 2407.
" sarcoma, alveolar, 2421–2426.
" " melanotic, 2427–2432.
" " round-cell, 2417–2420.
" " spindle-cell, 2411–2416.
" sarcomatous wart, 2424, 2425.
" sebaceous cyst, 2450–2458.
" sloughing from extravasation of urine, 2086.
" syphilitic ulceration, 2338.
" teratoma, 2390.
" tubercle, 2337.
Skull, necrosis, 2621.
" suppuration of diploe, 2621.
Spermatic cord, hydrocele, 2104–2109.
" " lipoma, 2166, 2167.
" " varicocele, 2165.
" " sarcoma, 2147, 2149, 2151.
" veins, phlebitis, 2116.
Spina bifida, 2509–2527.
" " occulta, 2524–2527.
Spinal cord, bifid, 2517.
Spine, lateral curvature, 2583–2587.
Spondylolisthesis, 2588.
Staphyloma, ciliary, 2687.
" corneal, 2678–2686, 2689.
" intercalary, 2688.
Stricture of urethra, 1945, 1952, 2075–2084, 2086, 2087, 2189, 2200
" " extravasation of urine, 2084, 2086, 2087.

Stricture of urethra, false passages, 2079, 2082, 2085.
„ „ multiple, 2083, 2087.
„ „ perineal abscess, 1952, 2079–2083.
Stumps, amputation, 2470–2486.
„ „ bulbous nerves, 2481.
„ „ conical, 2482–2486.
Suprapubic cystotomy, 1986.
Sweat-glands, hypertrophy, 2459.
Symphysis pubis, diastasis, 2549, 2551, 2552.
Syndactyly, 2560, 2562.
Synechia, anterior, 2642, 2656, 2659, 2667, 2698, 2700.
„ posterior, 2691, 2694, 2697, 2701, 2637, 2638, 2650, 2652, 2656, 2664-2667.
„ ring, 2691, 2694.
Syphilis of breast, 2220.
„ lung, 2144.
„ skin, 2338.
„ testicle, 2133–2144.
„ „ adherent tunica, 2133, 2134, 2136-2138, 2140-2142.
„ „ congenital, 2143.
„ „ diffuse, 2143.
„ „ gumma, 2133-2142.
„ „ ulcerating, 2135, 2139, 2141.
„ „ with hernia testis,
„ „ „ hydrocele, 2133, 2134, 2140.
„ tunica vaginalis, 2144.
Syringo-myelocele, 2521, 2522.

TALIPES calcaneus, 2577.
„ equinovarus, 2571–2574, 2576.
„ „ acquired, 2595–2597.
„ equinus, 2575, 2592–2594.
Tenotomy, 2593.
Teratoma of neck, 2506, 2507.
„ skin, 2390.
Testicle, adenoma. *See* Testicle, mixed tumours.
„ carcinoma, 2155–2159.
„ cystic tumours, 2160–2163.
„ cysto-sarcoma. *See* Testicle, mixed tumours.
„ hernia, 2128–2130.
„ inflammation, acute, 2115, 2116.
„ injury, 2088.
„ mixed tumours, 2160–2164.
„ sarcoma, 2145–2154.
„ „ fungating, 2151.
„ „ with hydrocele, 2145, 2146.
„ syphilis, 2133–2144.
„ „ congenital, 2143.
„ „ diffuse, 2143.
„ „ gumma, 2133–2142.
„ „ ulcerating, 2135, 2139, 2141.
„ „ with adherent tunica, 2133, 2134, 2136-2138, 2140-2142.
„ „ „ hydrocele, 2133, 2134, 2140.
„ tubercle, 2117–2132.
„ „ with abscess, 2117, 2121–2123, 2132, 2173.
„ „ „ adherent tunica, 2123, 2125, 2127, 2131.
„ „ „ hernia testis, 2128–2130.
„ „ „ hydrocele, 2124, 2126.
„ „ „ sinuses, 2121, 2124, 2126, 2129.
„ undescended, 2539, 2554–2557 A.
„ „ carcinomatous, 2159.
„ „ sarcomatous, 2154.
„ „ with hernia, 2557 A.

Tibia, absence of, 2566.
„ abscess, 2439.
„ malformed, 2568.
„ fracture, 2595.
Toes, absence of, 2578.
„ hammer, 2403, 2581, 2582.
„ supernumerary, 2579, 2580.
Tubercle of bladder, 1963, 2193.
„ breast, 2218, 2219.
„ choroid, 2707.
„ epididymis, 2117–2129, 2131, 2132, 2173.
„ kidney, 1914 A–1917.
„ nasal fossa, 2616 A.
„ prostate, 1915, 1963, 2132, 2173, 2193, 2194.
„ skin, 2337.
„ testicle, 2117–2132, 2173. *See also* Testicle.
„ tunica vaginalis, 2124, 2126.
„ ureter, 1916, 1917, 2194.
„ vas deferens, 1915, 1963, 2117–2119, 2123, 2125, 2126, 2128, 2131, 2132, 2173.
„ vesiculæ seminales, 1915, 1963, 2173, 2174.
Tunica vaginalis, acute inflammation, 2089, 2115, 2116.
„ „ adhesions, 2123, 2125, 2127, 2131, 2133, 2134, 2136–2138, 2140–2142, 2145–2147, 2150, 2152, 2155, 2163, 2164.
„ „ hæmatocele, 2110–2114.
„ „ hydrocele. *See* Hydrocele.
„ „ syphilis, 2144.
„ „ tubercle, 2124, 2126.
Tympanum, suppuration. *See* Otitis media.

ULCER, chronic, of leg, 2331.
„ corneal. *See* Cornea.
„ phagedænic, 2322.
„ neuropathic, 2335.
„ tertiary syphilitic, 2338.
Ulna, maldevelopment, 2563.
Undescended testicle, 2539, 2554–2557 A.
„ „ carcinomatous, 2159.
„ „ sarcomatous, 2154.
„ „ with hernia, 2557 A.
Ureter, atresia, 2553.
„ calculi, 1897–1899, 1908, 1911–1913, 1995.
„ dilated, 1874, 1875, 1897, 1898, 1910, 1922, 1928, 1945, 1947, 1949–1952, 1954, 1965–1968, 1980–1984, 1988, 1989, 1993, 1995, 1996, 2072, 2073, 2082, 2085, 2194, 2195, 2199, 2544, 2553.
„ double, 1962, 2553.
„ papilloma, 1922.
„ stricture, 1911, 1912, 1928.
„ tubercle, 1916, 1917, 2194.
Urethra, abscess, 2079–2084, 2175, 2183, 2184.
„ calculi, 1941, 2066–2074.
„ dilated, 1945, 1950, 2075, 2077, 2078, 2081–2083, 2087, 2183, 2200.
„ foreign bodies, 2064, 2065.
„ stricture, 1945, 1952, 2075–2084, 2086, 2087, 2189, 2200.
„ „ extravasation of urine, 2084, 2086, 2087.
„ „ false passages, 1948, 1950, 2057, 2079, 2082, 2085, 2179, 2183, 2185.
„ „ multiple, 2083, 2087.
„ „ perineal abscess, 1952, 2079–2082.
„ „ urinary fistula, 2082–2084.
Urinary fistula, 1993, 2072, 2082–2084.
Urine, extravasation, 2072, 2084, 2086, 2087.
Uterus, bicornis, 2544.
„ double, 2546, 2547.
„ unicornis, 2538.

VAGINA, double, 2546, 2548.
,, imperforate, 2544.
Varicocele, 2165.
Vas deferens, abscess, 2117, 2132.
,, ,, tubercle, 1915, 1963, 2117–2119, 2123, 2125, 2126, 2128, 2131, 2132, 2173.
Veins, spermatic, phlebitis of, 2116.
,, varicocele, 2165.
Vertebræ, additional centres in bodies, 2517, 2518.
Vesicula seminalis, carcinoma, 2195.
,, ,, excision, 2174.
,, ,, tubercle, 1915, 1963, 2173, 2174.
Vulva, venereal warts, 2404–2406.

WARTS, sarcomatous, 2424, 2425.
,, venereal, 2404–2406.
Wrist, ankylosis, 2562

END OF PART III.

PRINTED BY TAYLOR AND FRANCIS, RED LION COURT, FLEET STREET.